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# PRODUCTION, CONSUMPTION, AND TRADE OF COARSE GRAINS

## DEVELOPMENTS AND PROSPECTS FOR SELECTED FOREIGN COUNTRIES AND AREAS

195 JUN 15 1951

WORLD FOOD COUNCIL



## FOREWORD

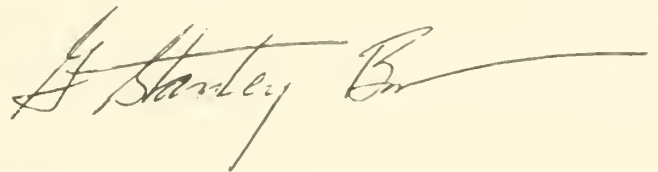
The United States is the world's major producer, consumer, and trader of coarse grains. Despite this preeminence, the grain policies of other nations have an impact on the United States. This is particularly true when the country happens to be a major importer or exporter of coarse grains.

Shifts in coarse grain production, consumption, and trade of other countries influence U.S. policy decisions in several ways. These "outside" developments have a bearing on the nature of the feed grains program pursued by the United States since the level of coarse grain production targeted annually depends in part on export possibilities.

Coarse grains are a major agricultural export of the United States and are highly important to our balance of payments. In 1966/67, the United States exported 21 million tons of coarse grains valued at \$1.2 billion (excluding products)--nearly one-fifth of our agricultural exports. Six years earlier (1960/61), coarse grain exports from the United States totaled only 11.2 million tons valued at \$539 million, one-tenth of our total agricultural exports.

This report looks briefly at trends in world production, utilization, and trade of coarse grains. The discussion centers on major coarse grain consuming or exporting countries (or regions) other than the United States and comments on trade prospects for 1970/71. An appraisal of probable developments in other countries or areas is designed to provide some insight into short-term problems (or opportunities) facing the United States in the world coarse grains market and on matters having a bearing on U.S. grain policy. This report also supports the ERS study for the Agency for International Development, "Analysis of Demand Prospects for Agricultural Products of the Less Developed Countries."

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EXPLANATORY NOTES

Coarse grains -- Corn, barley, oats, rye, millet and sorghum, and mixed grains.  
Feed grains include the coarse grains listed, less rye.

Time reference -- Split-year data, such as July 1 to June 30, are identified with a diagonal stroke (1966/67). Hyphens indicate averages (1965-67).

Weights and measures -- Unless otherwise indicated, metric tons are used throughout this report.

1 metric ton = 2204.6 pounds  
 1 quintal = 220.46 pounds  
 1 kilogram = 2.2046 pounds  
 1 hectare = 2.471 acres

## SUMMARY AND CONCLUSIONS

Expanding production abroad is threatening the traditional role of the United States as the world's major supplier of coarse grains. Member countries of the European Economic Community--along with the United Kingdom, Denmark, Spain, and Japan--accounted for three-fourths of world coarse grain imports in 1966/67. The continuing growth of domestic coarse grain production in all these countries, except Japan, dampens trade prospects for grain exporting countries, including the United States.

Even in Japan, there is strong evidence that increased availabilities of coarse grains by 1970/71 from countries such as Australia and Thailand will squeeze the traditional market share of other suppliers, particularly the United States.

High grain price policies pursued by some importing countries, such as the EEC, work against import expansion in two ways--domestic production is encouraged and the demand for feed grains is dampened.

The United States provided one-half of world coarse grain exports in 1966/67 and will continue as a major supplier in international markets. Argentina, Brazil, Mexico, Canada, Australia, Thailand, and the Republic of South Africa accounted for nearly three-fifths of the rest. The tremendous production potential of some of these exporting countries and the dependence of others on grain sales for export earnings augur for continued export expansion. Growth of the livestock and poultry industries in some countries, however, will tend to hold down increases in export availability.

Widespread crop failures or unusual acceleration in world demand--such as a sharp upturn in feed grain imports by Eastern Europe from the Free World or an unexpected thrust to livestock expansion--might increase world coarse grain imports above projected levels. Developments such as these seem unlikely and might be cyclical and/or short lived.

Net imports of coarse grains by major importers in 1970/71 are projected as follows:

EEC -- 10-12 million tons, somewhat below the 12.1 million tons of net imports in 1966/67 and the 12.5 million tons in 1965/66.

United Kingdom -- an amount approaching 4 million tons, somewhat above earlier levels, but with increased production nearly keeping pace with increased consumption.



Spain -- 2 million tons (nearly all in corn), about one-half million tons below the level of net imports of coarse grains estimated annually for 1967/68-1968/69.

Denmark -- a decline below the 0.4 million tons of net imports in 1965/66-1966/67 as production increases exceed consumption increases.

Japan -- an increase in net imports, from 6.5 million tons in 1965/66-1966/67 to 11 million tons in 1970/71, as domestic production continues to decline and consumption continues to increase.

Net exports of coarse grains by major exporters (excluding the United States) in 1970/71 are projected as follows:

Argentina -- increase in net exports of coarse grains above the level of 4.2 million tons in 1965/66-1966/67.

Brazil -- net exports of 1 million tons of corn, about double the level of 1965-67, with production increases exceeding consumption increases.

Mexico -- continuation of a net export position with exports of corn exceeding imports of other types of coarse grains.

Canada -- net exports of coarse grains are projected to remain just short of 1 million tons as consumption increases match production increases.

Australia -- net exports of all coarse grains may approach 1 million tons in 1970/71, up somewhat from the 0.8 million tons exported in 1965/66-1966/67.

Thailand -- Government policies directed toward expanding production of corn and sorghum will push net exports of coarse grains above the 1.2 million tons in 1967.

Republic of South Africa -- corn exports (net) are projected to reach 3 million tons, up sharply from the one-half million tons of corn exported in 1963/64-1965/66.

Projections of net trade for Eastern Europe and the USSR are as follows:

Eastern Europe -- net imports of nearly 1.5 million tons of coarse grains projected for 1970/71, about equal to net imports in 1961-65, as opposed to small net exports in 1965/66-1967/68 (0.2 million tons).

USSR -- net exports of slightly over one-half million tons of coarse grains in 1965/66-1967/68 are projected to increase to nearly 1 million tons in 1970/71.

U.S. exports of feed grains will continue to expand as will world feed grain exports. However, the United States will face increased competition from other exporters.

U.S. exports of feed grains in 1970/71 will increase from the 20-21 million tons exported in recent years. However, exports are not expected to reach the unusually high level of 25.4 million tons exported in 1965/66.

PRODUCTION, CONSUMPTION, AND TRADE OF COARSE GRAINS:  
DEVELOPMENTS AND PROSPECTS FOR SELECTED FOREIGN COUNTRIES AND AREAS

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INTRODUCTION

The decline in the world and U.S. price of feed grains--primarily corn, sorghum, barley, and oats--is causing concern over future demand-supply equilibrium. Corn prices, c.i.f. European ports, are at their lowest level in over a decade (app. fig. 1). Reasons for continued U.S. concern over the level of world feed grain prices and feed grain export markets are explored in this report.

World grain price trends reflect to some degree developments in supply-demand equilibrium. As shown in appendix figure 1, the international price of coarse grains remained relatively stable between 1958 and 1961, after falling from peaks in the mid-1950's, and then gradually increased through 1966, providing an incentive to increase production. This strengthening of prices reflects a rapid expansion of the livestock industry in such areas as the European Economic Community and Japan, and increased movement of coarse grains (sorghum) to India for use as food. The U.S. feed grain program and related storage activities lent stability to world market prices. However, substantial world grain production increases in 1966 and 1967 resulted in a fall in world market prices for several of the most important feed grains, beginning in the latter part of 1966.

Trends in world grain stocks also reflect the relationship between supply and demand as conditioned by varying price policies. Grain stocks of major grain exporters showed a consistent year-to-year rise between 1954/55 and 1961/62--from 35.8 million tons to 84.3 million tons (table 1). <sup>1/</sup> In 1961, the United States started a feed grains program designed to reduce feed grain acreage and cut production to avoid further stock increases. This program, combined with a rapid rise in world utilization of feed grains, caused stocks to show a general decline between 1961/62 and 1967/68. The United States, which most years since 1959/60 has accounted for about 90 percent of the stocks in major coarse grain exporting countries, entered 1968/69 with a significant increase in stocks. The good grain crop in 1968 led the United States to announce adjustments in the feed grains program which would further curtail feed grain production.

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<sup>1/</sup> All tables are in the appendix, p. 38.

## TRENDS IN THE PRODUCTION, UTILIZATION, AND TRADE OF COARSE GRAINS

Total world grain production advanced to nearly 1.1 billion tons in 1967 after exceeding the 1-billion-ton mark first in 1966 (table 2). Coarse grains account for almost half of total world grain output, with the remaining production about equally split between wheat and rice. World production of rye and oats has declined, while output of barley, corn, and millet and sorghum has increased. Rye output declined 1.2 percent and oats 2.9 percent annually between 1955-57 and 1965-67. Average annual percentage increases for other grains were: barley, 3.7 percent; corn, 3.8 percent; millet and sorghum, 3.9 percent. These trends brought the overall average annual increase in coarse grain output to 2.1 percent between 1955-57 and 1965-67--below the increase for wheat (2.7 percent) but above that of rice (1.7 percent).

### Trends in Output of Individual Coarse Grains by Major Producing Areas

Rye accounted for only 6.3 percent of total coarse grain output in 1965-67 (31.3 million tons) and its relative importance continues to decline. The Soviet Union, Eastern Europe, and the EEC (principally West Germany) jointly produce over 88 percent of the rye crop (table 3). Although rye production fell in all three of these countries or areas during the 10-year period 1955-57 to 1965-67, the major decline was in the EEC (2.9 percent annually). Three of the major producing areas expanded production during the decade, but the largest percentage increase occurred in Canada.

Although rye is considered a coarse grain in this study, a substantial proportion of production is consumed as food. This is especially true in the major producing areas--USSR, Eastern Europe, and West Germany--where large amounts of rye are used in bread baking. However, rising levels of living are reducing the demand for rye as a food grain.

The proportion of barley in total coarse grain production increased from 16 percent in 1955-57 to nearly 19 percent in 1965-67 (92.5 million tons), an annual rate of increase of 3.7 percent.

Dramatic shifts have occurred in the proportions of barley supplied by major producers. In 1955-57, the United States and Canada jointly produced 22 percent of the world barley output, compared with 15 percent in 1965-67. Conversely, the proportion produced by the USSR increased from 16 to 23 percent, and Western Europe's share (excluding the EEC) increased from 14 to 26 percent. Significant gains were also made in the European Economic Community.

Sharp advances in the share of world barley production on the part of some countries are further documented in the annual rate of change in output. The United Kingdom's annual increase in production between 1955-57 and 1965-67 was nearly 12 percent and that of the Soviet Union almost 8 percent. Some producers, including the United States, showed declines in the reference period.

World oat production declined 2.9 percent annually between 1955-57 and 1965-67 (44.7 million tons), accounting for 15 and 9 percent of coarse grain production, respectively. The only major oat-producing area to show an increase in output of any significance was Oceania (primarily Australia). The largest annual decline in oat production was in the United Kingdom (6.6 percent), followed by Argentina (5.6 percent), the USSR (5.0 percent), and the United States (4.4 percent).

The United States, USSR, EEC, and Canada were the major world suppliers of oats in 1955-57 as well as in 1965-67. However, the U.S. and the USSR shares of world oat production have shown a significant decline. On the other hand, Canada and the EEC have increased their relative proportions.

World corn production has increased at a rapid pace--3.8 percent annually between 1955-57 and 1965-67 (211.9 million tons). Only one major producer--the USSR--showed declining production. Country or regional annual increases during 1955-57 to 1965-67 ranged from a high of over 8 percent in Canada and Argentina to 3.3 percent in Eastern Europe.

The United States has dominated corn production, accounting for over one-half of world output. Eastern Europe (primarily Yugoslavia) is the next major supplier of corn, with nearly one-tenth of world output. Most of the other major producing countries or areas each supply about 3 percent of world output. Increases in the proportion of corn supplied by major corn-producing areas were primarily at the expense of the Soviet Union.

World corn production increases reflect the acceptability of corn as an excellent feed for livestock as well as the improved profitability of growing corn through the adoption of hybrid varieties.

World production of millet and sorghum increased 3.9 percent annually between 1955-57 and 1965-67 (54.0 million tons). As a result, the share of these grains in total coarse grain output rose from 9 percent to nearly 11 percent.

Countries or areas with the most rapid rise in millet and/or sorghum production included Mexico and Argentina, followed at a substantial distance by the Republic of South Africa and the United States. All other major producing areas showed some annual increase in production.

The U.S. share of the world's combined production of sorghum and millet increased from less than one-fourth in 1955-57 to one-third in 1965-67. South Asia dropped from the leading producer in 1955-57 (41 percent of output) to a par with the United States. Another major producing area is West Africa where the relative share of world production also declined.

## Coarse Grain Utilization

Aggregate world utilization figures are not available for coarse grains for recent years. 2/ Earlier data compiled by the Food and Agriculture Organization of the United Nations, as shown in table 4, indicate an annual increase in coarse grain utilization of 3.5 percent between 1955/56-1957/58 and 1961/62-1963/64 (6). 3/ Expansion of coarse grain output since 1962/63, combined with declines in stocks held by major exporting countries, is indirect evidence of further growth in utilization. Projections by the OECD point to continued expansion in coarse grain utilization in developed countries through 1985 (16).

In developed countries there has been a substantial decline in the amount of coarse grains going into food, but requirements for feed and industrial uses have risen. Developing countries have increased the amount of coarse grains used for all purposes. In 1961/62-1963/64, the developed countries used 6 percent of their coarse grain for food and 84 percent for feed. On the other hand, the developing countries consumed 65 percent of this coarse grain as food and fed only 23 percent to livestock.

The proportion of coarse grains going into livestock and poultry rations is growing. This area of derived demand will become increasingly important in determining future coarse grain requirements. But growing sophistication in the compound feed industry, particularly in Japan and the EEC, will promote further substitution among various feed concentrates, including grains. The use of grain substitutes is growing (e.g., increased use of corn gluten meal, protein meals, tapioca meal, sugar, etc.) and many of these substitutes are likely to offer an increasing challenge to feed grains. This development has already been forcefully demonstrated in the Netherlands where feed use of grains has declined substantially in recent years despite a significant increase in the number of animal units.

A high degree of interchangeability technically exists among individual grains used for feed but, in practice, less substitution between grains takes place in reaction to price change than would seem justified (5). Substitution among grains tends to increase when a large proportion of feed grain requirements are purchased on the market and greater use is made of compound feeds.

## Trade in Coarse Grains

Table 5 shows that international trade in coarse grains more than doubled between 1956/57-1957/58 and 1964/65-1965/66--from 18.3 million tons to 38.4 million tons. Despite these expanded shipments, the amount of coarse grains enter-

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2/ A 1968 report prepared by the Organization for Economic Cooperation and Development shows coarse grain availabilities in 1961-63 and projections of utilization to 1975 and 1985 for OECD member countries, Australia, and New Zealand (16).

3/ Underscored figures in parentheses refer to the Bibliography, p. 36.

ing international markets still amounted to less than 10 percent of total coarse grain production in 1964/65-1965/66. The bulk of the coarse grain is consumed where grown. Rapid increase in livestock production in the developed grain importing countries has stimulated import demand (see table 6 for grain import data). On the export side, a large part of the expanded world trade was shipments of corn and sorghum from the United States. However, a number of other countries--including Argentina, Republic of South Africa, and France--have also sharply expanded coarse grain exports.

### Trends in Individual Coarse Grain Exports of Major Producing Countries

Rye has not shared in the general expansion of international trade in coarse grains (table 7). In fact, world exports of rye in recent years have been about one-half the level of 1951/52-1955/56. The share of rye shipments by major exporters--the United States, Argentina, Canada, West Germany, Sweden, and the USSR--has generally declined. Although substantial year-to-year fluctuations are evidenced in the rye exports of each major shipper, all countries except the United States have shown a decline in the level of exports since 1951/52-1955/56.

World exports of barley have remained relatively stable from 1956/57 to 1965/66. As a result, the share of barley in coarse grain exports has declined. Major shipping countries usually account for around 80 percent of world exports. Exports of Argentina and Canada have fallen; France and, more recently, the United Kingdom have emerged as major exporters of barley.

World shipments of oats during 1956/57-1966/67 were below the 1.6-million-ton average in 1951/52-1955/56 for all but 1 year. The share of exports by the four major world shippers--United States, Canada, Argentina, and Australia--has tended to decline. Relating 1966/67 shipments to the early fifties indicates that Canada is primarily responsible for the decline.

Exports of corn quadrupled between 1956/57 and 1965/66--from 6.6 to 26.1 million tons. During this period, the share of corn in exports of major coarse grains increased from 37 to 62 percent. The United States is the major shipper of corn, accounting for nearly 60 percent of total exports in 1964/65-1966/67. Another 15 percent was supplied by Argentina.

Mexico, Brazil, Thailand, and France have emerged as major exporters of corn, although shipments by Mexico and Brazil are on a sporadic basis. On the other hand, the relative importance of Yugoslavia as an exporter of corn has declined sharply since the late fifties. Shipments by the Republic of South Africa also fluctuate sharply because weather variability causes wide year-to-year swings in production.

Pre-World War II (1934-38) exports of sorghum amounted to 618,000 tons, over half of which was supplied by Mainland China (5). During the postwar period, world exports of millet and sorghum have increased rapidly, while Mainland China's exports have become negligible. The United States was responsible for 70-80 percent of world exports of millet and sorghum for most years during 1956/57-1965/66. The second major world supplier of millet and sorghum is Argentina, which has also expanded production quite substantially since the early

fifties. Other exporters of less importance include the Sudan, Republic of South Africa, Morocco, and Australia. Major exporters account for around 95 percent of world exports of millet and sorghum. In 1965/66, millet and sorghum represented 17 percent of the world trade in coarse grains, compared with 11 percent during the first half of the 1950's.

The expansion in world sorghum trade reflects the introduction of high-yielding varieties in the United States and the increased use of sorghum in the feed compounding industry (5). Main importers of sorghum have been Western Europe and Japan where rapid expansion of mixed feed production is occurring. However, the threshold prices (minimum import prices) set by the EEC on feed grains have led to export problems for sorghums. The price differentials do not fully reflect the generally accepted differences in market and feeding values between sorghum and other feed grains.

#### NEAR-TERM DEVELOPMENTS FOR MAJOR COARSE GRAIN IMPORTING AND EXPORTING COUNTRIES

This section provides an evaluation of probable developments to 1970/71 in the production, utilization, and trade of coarse grains for selected major importing and exporting nations. Data shown in table 8 provide some guide to the "most likely" estimates for 1970/71 and support the increased concern about near-term international market possibilities. Expected developments in such factors as policy, technology, prices, and changing feed requirements are taken into account. The focus of the report is to show the general trend of developments in grains rather than to provide quantitative projections. The reader should be alerted to the fact that discussion sometimes shifts quickly from total grains to coarse grains. A general assumption of the study is that "normal" weather conditions will prevail in 1970/71.

As indicated earlier, the United States is vitally concerned with major world developments in feed grain production, consumption, and trade. Consequently, there is a need to appraise the near-term possibilities of expanding feed grain trade and the competition likely to be faced by the United States. Total U.S. exports of feed grains (excluding grain products) rose sharply from 17.5 million tons in 1964/65 to 25.4 million tons in 1965/66 and then declined to 20.8 million tons in 1966/67 and an estimated 19.7 million tons in 1967/68.

#### European Economic Community 4/

The European Economic Community (EEC) is the world's major coarse grain importer. Implementation of the Community's common agricultural policy for grains is stimulating increased production of grains, particularly in France. This is being accomplished through high target prices protected by variable import levies. No controls are imposed on grain output and provisions

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4/ European Economic Community (EEC), European Community, Community, and Common Market are interchangeable terms in this report. Full members are West Germany, France, Italy, Netherlands, Belgium, and Luxembourg.



are made for heavy subsidies on any grain exports to non-EEC countries. A surplus of soft wheat is being produced and larger amounts may be substituted for coarse grains in livestock feed. More fertilizer and better grain varieties are leading to higher yields. Area expansion of higher yielding corn and barley will continue at the expense of oats and rye. The recent relatively rapid rate of expansion in livestock and poultry numbers is expected to show some deceleration as a greater level of self-sufficiency in most animal products is achieved. Grain substitutes will loom large as a threat to the grain trade due to high grain prices. All these developments point to a decline in coarse grain imports by 1970/71.

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### Past Trends in Production 5/

Coarse grain output in the EEC increased 26 percent between 1955-57 and 1965-67. Comparable percentages for individual grains were: barley, 81; corn, 59; rye, -26; and oats, -18. France is the major coarse grain producer in the EEC (48 percent in 1965-67) and its relative share of total Community production is increasing. Area planted to coarse grains in the EEC declined 3.7 percent between 1955-57 and 1965-67 (compared with a 2.2-percent decline in wheat area). Area declines are in rye and oats. France is the only EEC country with an increase in total coarse grain area between 1955-57 and 1965-67.

Grain yields in the EEC in 1967 and 1968 were substantially above average, aided by generally favorable weather. Yields also increased significantly during 1955-57 to 1965-67, as indicated by the following figures (in percentages): rye, 14; barley, 25; oats, 30; and corn, 41.

### Factors Affecting Production

The Common Agricultural Policy (CAP) of the EEC is stimulating increased Community production of grains. This is being accomplished through high target prices, variable import levies, and a domestic price support system. No controls are imposed on grain output, and provisions are made for heavy subsidies on grain exports to non-EEC countries if surpluses occur.

Grain prices agreed to in December 1964, and effective on July 1, 1967, when the grains market was harmonized, were later increased for coarse grains to provide a further price incentive for larger outputs of barley and corn.

The aggregate use of mineral fertilizers in the EEC has shown a significant increase. Between 1955/56-1957/58 and 1966/67, the use of nitrogen in-

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5/ Unless otherwise stated, rice is excluded from the analysis in the country or regional statements.

creased 90 percent, phosphates nearly 50 percent, and potash 36 percent (all in terms of plant nutrients). Member countries show a wide diversity in the application of fertilizer per acre. Applications are highest in the Netherlands and Belgium with France and Italy at the lower end of the scale. Rates of fertilizer application in France, however, vary substantially by region and are highest in the north (the major grain area).

The member countries of the EEC are actively involved in developing new and improved plant varieties. Improved strains of barley have been developed in France and Holland, and hybrid corn is being planted on a wide scale in Italy and France.

Despite the small size of farms in the EEC, mechanization has been proceeding at a rapid rate since 1950. Numbers of tractors and combines have more than quadrupled. Increased mechanization permits timeliness in planting and harvesting activities. Nevertheless, the small size and fragmentation of farms in the EEC compel many farmers to farm intensively (e.g., dairying) rather than extensively (e.g., grains).

### Utilization

The use of coarse grains for feed in the EEC has expanded at a faster rate than has domestic production. In 1966/67, coarse grains consumed as feed exceeded domestic production by 4.2 million tons, or by 13 percent (total use exceeded domestic production by 12.3 million tons). Of coarse grain supplies (production minus exports plus imports), 81-82 percent are used as feed while approximately one-fifth of the wheat produced in the EEC is used for feed. France and West Germany account for over 95 percent of the wheat fed to livestock in the Common Market.

Wheat moves into feed use in the EEC by one of two methods--through direct "on farm" use without benefit of subsidy and through the use of premiums for denaturing. The quantity of wheat denatured by the various EEC countries seems to hinge on the availability of export markets for wheat, the quality of the wheat produced, and the amount of the denaturing premium.

Grain feeding in the EEC has increased because of the growth in livestock numbers and in the quantity of grain fed per animal. Livestock and poultry numbers are continuing to expand although at a reduced rate. Grain fed per animal unit is still rising but at a decelerating rate.

The high cost of feed grains in the EEC is leading to increased use of grain substitutes, including grain byproducts, molasses, and high protein meals. This trend is most pronounced in the Netherlands where linear programming is being used extensively to determine formulas in the mixed feed industry. Expansion of the mixed feed industry in the Common Market is facilitating increased use of grain substitutes.

## Trade

Net imports of coarse grains by the EEC more than doubled between 1955/56 and 1966/67--from 5.8 to 12.1 million tons. This import trade reflects a growing preference for corn over other feed grains available on international markets. The U.S. share of the Common Market's coarse grain imports averaged 52 percent in 1963/64-1965/66, compared with 35 percent in 1955/56-1957/58. However, substantial variation occurs from year to year in the U.S. share. Between 1955/56-1957/58 and 1965/66-1966/67, intra-EEC trade in coarse grains more than tripled, while imports from nonmember countries doubled.

France has emerged as an important exporter of both wheat and feed grains. Feed grain exports totaled 3.8 million tons in 1966/67, nearly all of which were corn and barley.

## Projections 6/

Coarse grain production in the EEC in 1970 is expected to total 36-38 million tons (the record harvest of 1968 is estimated at over 37 million tons). The top range of the estimate assumes generally favorable weather, higher grain yields by way of using more fertilizer, a wider adoption of the better grain varieties, and further expansion of higher yielding corn and barley at the expense of lower yielding oats and rye.

Food and industrial uses of grain remain fairly stable from year to year; thus, the critical component in estimating future grain utilization trends in the EEC is feed use. A recent slowing in the expansion of livestock and poultry numbers, a tendency to substitute grain byproducts and other concentrated feed-stuffs for grains, and high feed grain prices in the Common Market may lead to near-term slackening in the rate of increase in grain requirements. Total coarse grain utilization in 1970/71 is estimated at 48 million tons. 7/

The estimate of the Common Market's net imports of coarse grains in 1970/71 is 10-12 million tons. This compares with net imports of 12.1 million tons in 1966/67, 12.5 in 1965/66, and 9.4 in 1964/65.

## United Kingdom

The agricultural policies of the United Kingdom have stimulated domestic grain production through a system of support payments and minimum import prices. As a result, production of coarse grains has increased. Both area and yield are up, and although the demand for coarse grains has increased significantly, production has increased sufficiently so that import re-

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6/ A number of studies carry projections for individual member countries (13, 17, 18, 20).

7/ A recent proposal by the EEC Commission to impose a heavy tax on vegetable oils and protein meals could lead to increased utilization of grains for feed in the Community. However, it is the intention of the Community that the only expansion in grain use for feed should be that of domestically produced surplus soft wheat.

quirements have declined. Policies growing out of efforts to ease an unfavorable balance of payments may result in a further decline in coarse grain imports by 1970/71.

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### Past Trends in Production

Total grain output in the United Kingdom increased 62 percent between 1955-57 and 1965-67--from 8.6 to 14.0 million tons. Output in 1967 reached a record 14.6 million tons. Although the forecast is for somewhat lower production in 1968, it is still expected that total grain production will exceed 14 million tons.

Most of this increase can be attributed to increased production of barley. Although output of barley in 1955-57 was only 2.9 million tons, by 1965-67 production had risen to 8.8 million tons, an increase of nearly 200 percent. On the other hand, output of rye, oats, and mixed grain has been declining. The United Kingdom does not produce corn commercially.

The increases in grain production can be attributed to expansion in both area and yield. From 1955-57 to 1965-67, grain area in the United Kingdom increased 736,000 hectares, or roughly one-fourth. The area devoted to wheat increased from an average of 857,000 to 955,000 hectares, while the area devoted to coarse grains increased from 2.2 million to 2.8 million hectares. The area in rye, oats, and other grains declined, but the area devoted to production of barley grew from 977,000 to 2.4 million hectares, or by 142 percent.

Increased use of advanced technology has resulted in significant increases in the yields for all grains. The largest increases were recorded for oats and rye. However, yields per hectare for barley grew almost 30 percent during the period between 1955-57 and 1965-67.

### Factors Affecting Production

The agricultural policies adopted by the United Kingdom have been conducive to increases in domestic agricultural production. In the case of grain, increases in domestic production are encouraged by a system of deficiency payments under which the Government pays the farmer the difference between the market price and a Government-supported minimum price. In 1964, a system of minimum import prices was announced for grain to provide further protection for the level of farm prices in the United Kingdom.

Total consumption of all commercial fertilizers, in terms of plant nutrients, increased from nearly 1 million tons in 1955/56 to over 1.5 million tons in 1965/66. The most significant increase was recorded in the use of nitrogenous fertilizers. Despite these increases, the United Kingdom still ranks well below many other West European countries in per acre use of commercial fertilizers. The possibility exists, therefore, that production per acre may be increased further through more intensive application of fertilizer.

Perhaps the best measure of mechanization is the rate of increase in number of tractors. In 1950, there were 332,000 tractors recorded in Great Britain (comparable statistics are not available for the United Kingdom). <sup>8/</sup> By 1964, this number had increased to 496,000. Even more substantial increases have been recorded in the number of pieces of other field equipment essential to grain production in the country.

Plant breeders in the United Kingdom have provided improved strains and varieties of plants which are not only capable of higher yields, but are resistant to diseases and lodging and make it profitable to use heavier applications of fertilizer. Use of improved varieties has also contributed to increased grain yields.

Because of their larger size, farms in the United Kingdom can generally make more effective use of modern farm machinery and equipment than farms in continental Europe. Approximately 36 percent of all farms in the United Kingdom are at least 20 hectares in size; an additional 25 percent are between 6 and 20 hectares. In contrast, only about 13 percent of the farms in the EEC are larger than 20 hectares.

### Utilization

Demand for coarse grains in the United Kingdom, primarily for feed, has increased significantly, reflecting the increase in livestock numbers in the country. In 1965-67, the demand averaged nearly 13 million tons. Most of the total supply (over 75 percent in 1965-67) is used for livestock feed, although the demand for seed and industrial use has been increasing. Barley is used in the largest quantities for livestock feed, followed in importance by corn (all imported), oats, and sorghum (all imported).

The available supply of wheat has fluctuated widely--from a high of 8.2 million tons in 1954/55 to a low of 7.3 million tons in 1961/62. The largest share of the available supply of wheat in the United Kingdom is still consumed as human food (70 percent in 1966/67), although the consumption of wheat for food has been declining. The use of wheat for livestock feed during this period varied from 20.4 to 33.8 percent of the total supply, depending on the size and quality of the harvest. In 1965/66, for example, when the poor quality of the harvest rendered a large portion of domestic wheat production unsuitable for anything but livestock feed, the amount of wheat used for livestock feed increased 20 percent.

### Trade

The United Kingdom is an important importer of grain. However, since 1961/62, imports have been declining. During the period 1964/65-1966/67, the average level of imports declined to 8.5 million tons, compared with an average of 9.5 million tons during 1958/59-1960/61. Wheat normally constitutes at least

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<sup>8/</sup> Great Britain consists of England, Scotland, and Wales. Northern Ireland is not included.

50 percent of U.K. grain imports. It is followed in importance by corn, millet and sorghum, and barley.

### Projections

Jones et al., Oxford University, recently completed a supply and demand study of the United Kingdom (11). This study contains projections to 1970 (and 1975 and 1980) for grains as well as a number of other agricultural products. The projections for 1970 assumed a continuation of current agricultural policies, with some decline in the level of Government supports. The base period of the study is 1959-63.

The United Kingdom's National Plan places grain output in 1970 at 16.3 million tons, net of seed. Jones forecasts 1970 production of wheat, barley, and oats at 13.7 million tons (compared with a yearly average of 9.4 million tons in 1959-63). The total grain area in 1970 is projected by Jones to increase only moderately from 1966, but grain yields are projected to increase 1.5 percent annually until 1970.

Utilization of grain for feed is projected by Jones to increase from 10.9 million tons annually in 1959-63 to around 14 million tons in 1970. Food and industrial uses are also expected to increase but the major absolute increase will be for feed.

With regard to grain import requirements, the study concludes: "...It is difficult to see any rise in the requirement for grains; even though the demand for maize is (projected to be) up by 1970 in view of specific uses in poultry feed and industry, it may be displaced by still higher supplies of domestic grain for feed purposes."

A report issued by the Economic Development Committee for Agriculture, established to study the possible import-saving role of agriculture, proposed a large increase in grain production--about 3.5 million tons--between 1967/68 and 1972/73 (15). The Minister of Agriculture modified the EDC goals, indicating that because the additional land required would involve movement into less fertile areas and because of uncertainty of such factors as weather, actual production will probably fall far short of the EDC proposals. Despite the Minister's modification, a large increase in grain production still can be expected.

### Spain

Spain aims at self-sufficiency in grains and is implementing policies to reduce wheat surpluses and to increase production of coarse grains, mainly through a shift in grain area from wheat to barley. About 10 percent of the grain area is under irrigation where fertilization rates may be significantly increased. Expansion of livestock and poultry raising in recent years has sharply increased feed requirements; coarse grain imports nearly quadrupled between 1960-62

and 1965-67. Further increases in coarse grain use are expected to be more than met by production increases so that imports of coarse grains by 1970/71 will be below the level of imports (2.4 million tons) in 1967/68-1968/69. Imports of coarse grains in 1970/71 are expected to be nearly all in corn and sorghum, since Spain is expected to be self-sufficient in barley.

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### Past Trends in Production

During 1965-67, aggregate grain production in Spain averaged 9.2 million tons, compared with 7.8 million tons a decade earlier. In 1968, total grain production rose to 11.6 million tons, about 1.3 million tons more than in 1967.

Coarse grain production during 1965-67 averaged slightly over 4.1 million tons--20 percent above a decade earlier. Preliminary data for 1968 shows coarse grain production slightly exceeding 6 million tons, including 3.7 million tons in barley and 1.5 million tons in corn.

About 7.0 million hectares annually were planted to grains during 1965-67. In 1968, total grain area was up to 7.4 million hectares. Coarse grain area in 1968 totaled 3.5 million hectares, nearly one-fourth above the average in 1965-67 but only 13 percent higher than in 1955-57. Slightly more than one-tenth of total grain area was irrigated in 1965-67--about one-half in wheat and more than one-third in corn.

There were significant increases in grain yields between 1955-57 and 1965-67 as a result of expansion of irrigated area, improved farming practices, and use of better quality seed. However, the sharp rises in grain yields in both 1967 and 1968 are attributed primarily to very favorable weather.

### Factors Affecting Production

Spain has become a surplus producer of wheat and is aiming at self-sufficiency in coarse grains to reduce import requirements. In the past 3 years, there has been increased emphasis on production of coarse grains and on reduction of wheat surpluses. The Government uses price support programs, programs of financial assistance, market arrangements between producers and processors, and other programs to encourage production of grains.

Most coarse grains are still largely sown and harvested by hand. Wheat, although usually hand sown, has been mechanically harvested for many years (the emphasis given to wheat production until 1965 promoted harvest mechanization). Greater use of fertilizer on nonirrigated land, which produces most of the nation's grains, is limited because of possible damage to crops in years of drought. However, some grain is grown on irrigated land where rates of fertilization may be significantly increased. A high degree of fragmentation of farms in the major corn-producing areas of the north will handicap output expansion of this grain.

## Utilization

Total utilization of coarse grains increased from an average of 3.5 million tons a year in 1955-57 to 7.1 million tons a year in 1965-67--6.0 million tons of which were used for feed. Expansion of livestock (particularly hogs) and poultry raising has sharply increased feed requirements.

## Trade

Imports of coarse grains during 1965-67 averaged slightly more than 3.0 million tons per year, nearly a fourfold increase over the average in 1960-62. Corn is the principal feed grain import. The United States has been Spain's major supplier of coarse grains. Spain has shifted from a net wheat importer in the early 1960's to a net exporter in recent years.

## Projections

Total grain production in 1970 is estimated at 11.5 million tons, including almost 6.7 million tons in coarse grains. This represents nearly a 1-million-ton increase in coarse grains and a 1-million-ton decrease in wheat production from the 1968 levels.

Because of expected increases in the production of pork and poultry meat, feed utilization of coarse grains in 1970 is estimated at 7.3 million tons--more than 1 million tons over the 1965-67 average and about 700,000 tons more than in 1968. Direct consumption of wheat will continue to decline as per capita income rises. The use of wheat for feed in 1970 is not likely to exceed 500,000 tons as a result of expected cuts in surplus wheat production.

Spain's imports of coarse grains in 1970/71 are expected to total around 2 million tons, nearly all in corn.

## Denmark

Denmark adjusted its agricultural policies in 1967, reinforcing factors causing a shift from bread grains to feed grains, particularly barley. Barley area has expanded rapidly. Yields of all major grains are among the highest in Western Europe. The feeding of coarse grains to livestock has increased 50 percent over the past decade, and barley now constitutes about 70 percent of total feed grain consumption. Barley imports are expected to cease by 1970/71, while corn imports are expected to decline slightly.

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## Past Trends in Production

Short- and long-run forecasts indicate increasing self-sufficiency in Denmark in grains. This is already an accomplished fact for wheat, and nearly so for rye and barley.

Barley dominates grain production, accounting for over 70 percent of total output. Production of barley was over 4.2 million tons in 1965-67, rising from about 2.4 million in 1955-57, or by nearly 80 percent. Rye production reached a peak in 1961 and has declined since, due partly to declining demand for rye. Wheat production increased sharply in the 1960's but has declined in recent years to a stabilized level which should cover domestic consumption.

A major development has been the shift out of wheat, rye, and mixed grains into barley. Area sown to barley fluctuated between 600,000 and 760,000 hectares in the late 1950's, and rose to over 1 million hectares in recent years. Wheat and rye area increased until the early 1960's but declined in the past few years.

Although increased production has been due chiefly to larger acreage, yields of all the major grains increased to levels among the highest in Western Europe. Rye yields increased by 20 percent, while oats, wheat, and barley increased by 13, 11, and 4 percent, respectively (1955-57 to 1965-67 comparisons).

## Factors Affecting Production

Previously independent from Government intervention, the Danish grain producer has required increased subsidization since 1958. However, in recent years guaranteed supports to bread grain producers have been discontinued, and now bread grains are supported by minimum import prices and variable levies, as is the case with feed grains. This affords less support to bread grain producers and reinforces a shift from bread grains to feed grains (particularly barley).

The effect of mildew on yields of barley has been reduced by using resistant varieties, such as Emir and Lofa. The small plantings of winter barley have been discontinued to control the spreading of mildew diseases from the winter to the spring crop.

## Utilization

Denmark's use of coarse grains for feed increased from over 3 million tons in 1955/56 to more than 5 million tons in 1966/67--a gain of over 50 percent. There has been increased use of nongrain feeds, reducing the likelihood of any significant increase in demand for feed grains in the near future. Increased consumption of oilcake and other protein supplements, including domestically produced horse beans, has reduced the demand for imported feed grains.

Consumption of barley represents about one-fourth of all feeds consumed, and about 70 percent of total feed grain consumption. The importance of barley in the livestock economy will increase; however, barley imports should phase out

by 1970. The share of wheat and rye used for feed has not changed significantly, averaging around 38 percent of available bread grain supply. Per capita consumption of wheat and rye for food is likely to continue to decline slowly following the pattern of decreasing bread consumption throughout most of Western Europe.

### Trade

Grain trade is decreasing. Barley imports trended upwards from 1955 to the early 1960's, but declined in recent years. This trend will continue as self-sufficiency in barley is approached. Wheat and rye imports declined to low levels by 1966/67. In the mid-1950's, wheat imports averaged over 200,000 tons, and rye over 100,000 tons.

Corn imports increased sharply from 28,000 tons in 1955/56 to 218,000 tons in 1966/67. However, corn imports are expected to decline slightly from current levels.

### Projections

Consumption of feed grains, primarily barley, is expected to show further increases by 1970/71. On the other hand, use of wheat and rye for feed will likely show a rather sharp decline as production of these grains drops. Total production of all feed grains, however, will increase faster than consumption, causing net feed grain imports by 1970/71 to fall below the 0.4 million tons imported in 1965/66-1966/67.

The increase in total grain requirements will largely be due to a moderate rise in hog numbers. However, most of the feed requirements for hogs will be met by domestically produced barley and dairy byproducts. Poultry and egg production should continue to decline and feed requirements for this sector will decrease. The number of milk cows is also expected to show some decline, due to low export prices for butter, relatively unfavorable prospects for cheese exports, and reduced domestic whole milk consumption. Although beef and veal production is likely to increase, herd numbers are not expected to show any significant change unless the Government develops a more favorable policy towards beef production.

### Japan

Unlike other major grain importing countries, Japan shows a downward trend in coarse grain production. Production declined by half between 1955-57 and 1965-67. Concurrently, utilization increased because of expanded feed and industrial requirements. Imports of coarse grains during the past decade have more than quadrupled and are expected to continue rising through 1970/71. Japan will continue as an important market for U.S. feed grains. However, the Japanese Government is developing alternative sources of feed grain supplies through programs of technical assistance and capital investment. Corn production potentials in Indonesia

and Cambodia are being investigated and plans are being made and programs implemented for promoting production of corn and sorghum in Thailand, Tanzania, Australia, and Brazil.

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### Past Trends in Production

Coarse grain production in Japan decreased from 2.7 million tons in 1955-57 to 1.4 million tons in 1965-67, a decline of 50 percent. Two-thirds of the grain produced in 1955-57 (excluding rice) were coarse grains, but by 1965-67 this proportion had declined to 55 percent and consisted primarily of barley. During the same period, coarse grain area declined by three-fifths, compared with a one-third decline for wheat. Yields of most grains have increased from 12 to 18 percent since 1955-57. Corn, with a 37-percent increase, is an exception.

### Factors Affecting Production

Most of the grain produced in Japan is sold directly to the Government at established parity prices. This is part of the Government's program of supporting, guiding, and protecting agriculture. The attempt to expand livestock production has implications for coarse grains but the impact will be greater on grain imports than on indigenous grain production.

Application of fertilizer (pure plant nutrients) in Japan has expanded at a rapid rate. Between 1950 and 1965, the use of nitrogen increased by two-thirds, phosphate doubled, and potash increased more than fivefold. Farm mechanization, also on the increase in Japan, is helping to cut labor requirements, expedite harvesting, and intensify land utilization.

### Utilization

The most dramatic change in barley utilization since 1955/56 is the sharp decline in its use as food--from 2.5 million tons in 1955/56 to one-fourth this amount in 1967/68. However, increased amounts of barley are being used for feed and manufacturing.

Corn is the major feed grain used in Japan, increasing from 1.6 million tons in 1960/61 to 3.5 million tons in 1967/68. Grain sorghum is Japan's second most important feed grain with consumption estimated at 2.5 million tons in 1967/68. Both corn and grain sorghums are important ingredients in Japan's expanding mixed feed industry. Only 2-3 percent of Japan's wheat supply now moves into feed use, compared with 15 percent in 1962/63.

Feed use of grains increased about 40 percent between 1963/64 and 1966/67. Hogs and chickens, the two major grain-consuming classes of livestock, have been increasing rapidly in Japan as higher income levels have led to more demand for pork and poultry.

## Trade

Japan's grain imports have risen rapidly, going from 3.8 million tons in 1956/57 to 12.0 million in 1966/67. Coarse grains account for nearly four-fifths of the increase.

The Japanese Government is developing alternative sources of feed grain imports through programs of technical assistance and capital investment. Corn production potentials in Indonesia and Cambodia are being investigated and plans are being made for promoting corn and sorghum production in Thailand, Tanzania, Australia, and Brazil. The Japanese Government views these developments as essential to the guaranteeing of adequate supplies of feed grains at relatively low prices.

The U.S. share of Japan's major coarse grain imports varies substantially from year to year, depending on the size of the feed grain harvest in other exporting countries and on how competitive the U.S. price is compared with other suppliers. The U.S. percentages in 1967 and in 1966 (shown in parentheses) were as follows: barley, 23, (59); corn, 40 (62); millet and sorghum, 86 (89).

## Projections

Total coarse grain production, based on recent trends in areas and yields, is estimated to fall below a million tons by 1970 (output was 2.7 million tons in 1955-57 and 1.4 million tons in 1965-67).

Rising consumer incomes and a continuing expansion in the demand for meat and other livestock products are expected to push Japan's coarse grain consumption to around 12 million tons by 1970/71.

The most probable level of Japan's coarse grain imports in 1970/71 is placed at 11 million tons. However, the price relationship between coarse grains and other concentrated feedstuffs will influence the level of coarse grain imports.

## Argentina

Coarse grain production increased over 60 percent between 1955-57 and 1965-67. More land is being planted to corn and grain sorghum and less to barley and oats. The Government is encouraging investment in agriculture and pursuing policies designed to encourage exports. Argentina is expected to remain a strong competitor in the world market for grains and to further expand corn exports by 1970/71, despite rising domestic feed requirements in hog and poultry production.

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## Past Trends in Production

Argentina's coarse grain production averaged 9.7 million tons in 1965-67, or an increase of nearly 60 percent from the 1955-57 average. Due to a relatively large expansion in corn and grain sorghum, production of coarse grains as a share of total grain production increased between 1955-57 and 1965-67.

Coarse grain area increased 9 percent from 1955-57 to 1965-67. In the last decade, corn and grain sorghum acreages have expanded with land being shifted away from the production of barley, oats, and rye. Argentine corn yields dropped sharply after World War II, but with the aid of hybrid seed, yields have increased over 37 percent between the periods 1955-57 and 1965-67, resulting in a level exceeding that of the World War II years. Relatively high yields have made grain sorghums strongly competitive with other crops for land use.

## Factors Affecting Production

The greatest encouragement to new investment in agriculture has come indirectly from the considerable success of the Government's stabilization program. Some boost to investment was also provided when the peso was devalued by 40 percent in March 1967. Government discouragement of inefficient sugarcane production may result in a portion of this land being shifted to grain production.

Crop yields in Argentina are uniformly low, compared with those of competing countries, because fertilizer application is not a regular practice due to easy early successes with fertile soil. Fertilizers can be used effectively on many soils but research is needed to determine optimum levels.

## Trade

Argentina is a strong competitor in the world feed grain market. During the past decade, it has been the supplier for about one-sixth of the volume of corn exports and about 13 percent of the export trade for millet and sorghum. Argentina's exports fluctuate considerably from year to year, however.

## Projections

Argentina has great unused capacity for increasing production of many agricultural products. The quantity of grain that can be absorbed in world trade thus will be a determining factor in how much Argentina produces in future years. Coarse grain production may total 12 to 12.5 million tons in 1970, compared with the 1965-67 average of 9.5 million tons. Production increases for corn and grain sorghum should offset possible reductions in rye, barley, and oats production. For a large expansion in coarse grain production, Argentina would need new varieties, more mechanization, and wider use of fertilizer as well as lower cost fertilizer.

With more grain being used in hog rations and to expand the poultry industry, domestic demand for feed grains should continue strong through 1970/71.

By 1970, exports are likely to expand for wheat, corn, and sorghums, compared with the 1956-61 level. Producer prices in Argentina are likely to remain highly competitive with those in other corn-exporting countries.

### Brazil

During the past decade, overall production of coarse grains has increased while wheat production has fallen sharply. Corn plantings, the bulk of the coarse grain area, have increased rapidly in recent years. Higher support prices for corn have also promoted use of improved seed and more fertilizers and insecticides. However, expansion of corn into less favorable areas has dampened yield increases. Exports accounted for only 1 percent of the corn produced in 1950-64--mainly flint-type corn exported to Italy--but the Government expects to improve its future export position by emphasizing output of soft hybrid varieties.

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### Past Trends in Production

Output of all coarse grains changed in Brazil between 1955-57 and 1965-67 as follows, in percentages: rye, -15; barley, -6; oats, 53; and corn, 60. Production of the first three grains, however, is still relatively unimportant. Wheat production has fallen sharply from the record level in 1956 when high prices offered much incentive to producers.

Area seeded to corn, which accounts for the bulk of the coarse grain acreage, has increased rapidly in recent years, climbing from 5.9 million hectares in 1955-57 to 8.4 million hectares in 1965-67. Average corn yields have not increased nearly as much as acreage due to the extension of production into less favorable areas. Average wheat yield in 1965-67 changed little from the 1955-57 average.

### Factors Affecting Production

Early in 1964, the Government established a system of higher support prices providing incentives for producers to expand output of corn. The higher support price has been effective in promoting larger corn crops.

Since 1950, greater emphasis has been placed on inputs of improved seeds, fertilizer, and insecticides. Extension of corn production into less productive areas has tended to offset increased use of hybrid varieties for yield improvements.

Due to ecological and disease problems with wheat, future expansion of grain production probably will be in rice, corn, or sorghum.

## Utilization

Little information is available on grain utilization in Brazil. The rather rapid expansion in hog and broiler production has undoubtedly increased feed grain requirements, and total consumption has increased. However, there is evidence of a negative income elasticity for direct consumption of corn, indicating a probable decline in consumption of corn for food (19, p. 50).

## Trade

Brazil's coarse grain trade has been comparatively insignificant; only around 1 percent of the corn output was exported in 1950-64, mainly flint-type corn to Italy. During 1965-67, however, corn exports increased substantially, averaging almost 5 percent of production.

## Projections

Higher corn yields are expected with wider use of hybrid seed. Improved market facilities may lead to some improvement in corn exports. In 1968/69, for example, corn exports are expected to be about 1.1 million tons, compared with about 0.6 million tons during each of the years 1965-67. Exports in 1970/71 may also total about 1.0 million tons. This, together with rising domestic demand, could lead to a 13-million-ton crop in 1970. The Government is emphasizing output of the soft hybrid varieties.

## Mexico

Since 1964/65, Mexico has become a net exporter of coarse grains rather than a net importer, as it has been traditionally. Corn is by far the leading grain produced in Mexico, but sorghum has also become important since its introduction in the early 1950's. Coarse grain production will continue to increase through 1970/71, but expansion in domestic demand for feed and industrial uses can be expected to dampen any further expansion in net coarse grain exports.

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## Past Trends in Production

Production of coarse grains has expanded rapidly in Mexico in recent years--from 4.8 million tons in 1955-57 to 9.6 million in 1965-67--with corn accounting for most of the increase. Corn is by far the leading grain (72 percent of all grains produced in 1965-67). Grain sorghum has become important in Mexico only since its introduction in the early 1950's, while corn is a traditional staple that is grown in all parts of the country.

Corn area climbed over one-third from 1955-57 to 1965-67, in contrast to decreases for both barley and oats. During the same period, average corn yield improved 37 percent, oats 12 percent, and barley 23 percent.

### Factors Affecting Production

Mexican agricultural policies are directed toward increasing self-sufficiency in the basic crops; they feature price and marketing assistance, and stiff barriers against agricultural imports. Increased irrigation, associated with greater use of fertilizer and hybrid seed, has brought about higher yields.

### Utilization

Although per capita consumption of corn will probably decline, there is expected to be an expansion in aggregate direct consumption for cereals and in their consumption for livestock feeding and industrial use.

### Trade

Mexico's imports of oats and barley are relatively small, fluctuate widely, and show no trend during the past decade. Sorghum production has increased rapidly and Mexico now exports small quantities. Mexico has achieved its goal of self-sufficiency in corn production and exports its surpluses. However, present Mexican policy is not designed to encourage grain production for export.

### Projections

Production of coarse grains is expected to increase in Mexico and may reach 11 million tons by 1970. Only about one-tenth of the harvested area for corn is irrigated. There may be a small further increase in the corn planted on unirrigated areas, which may slow down yield increases.

Mexico's 5-year development plan for 1966-70 states that any surplus of wheat is to be used to stabilize prices and supplies and is not for export. Barley and oats are likely to continue to be imported by Mexico with demand growing faster than domestic production. Corn will continue to be in a surplus position in 1970 and the volume of its exports will exceed imports of other coarse grains. Some exports of sorghum are also likely.

### Canada

Despite lower area, Canadian coarse grain production has increased in the 1960's. This is due largely to increasing yields. Although Canada remains a net exporter of coarse grains, increased consumption at home and greater competition abroad have resulted in a lower level of exports than a decade earlier. Some expansion of coarse grain area and production by 1970/71 is like-



ly to meet the expanded domestic demand and to maintain Canada's export market.

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### Past Trends in Production

Canadian coarse grain production averaged 14.5 million tons in the 1965-67 period for a 7-percent increase over the 1955-57 average. Production changes for the individual grains between 1955-57 and 1965-67 show increases of 53 percent for rye, 4 percent for barley, 125 percent for corn, and 20 percent for mixed grains; oats production was down 13 percent.

Planted coarse grain area dropped from 9.1 million hectares per year in 1955-57 to 7.5 million in 1965-67, an 18-percent decrease. Despite lower area, Canadian coarse grain production has not decreased. This is due to the general rise in yields caused by increased levels of inputs and improved varieties. Barley yields were up 42 percent, corn yields over 41 percent, oat yields 16 percent, and rye yields about 27 percent.

### Factors Affecting Production

The Canadian Wheat Board, assisted by the Board of Grain Commissioners and by the private grain trade, operates a monopoly for commercial marketing, including exports on behalf of grain producers (wheat, barley, and oats) in the Prairie Provinces. In addition to pricing activities, the Board buys, stores, and sells, or otherwise disposes of, grains under pooling arrangements for various grades of each crop. It has the power to establish delivery quotas, based upon permit books issued to each producer or producer group, to promote orderly production and marketing.

Improved cultural practices, new varieties of grains, and increased use of fertilizer and machinery have contributed to the higher production in recent years. Total fertilizer sales for consumption rose by over 79 percent in Canada between 1961/62 and 1965/66. The development and use of short-season corn varieties and expanding area, largely in Ontario Province, have resulted in rapid increases in corn grain production. This expansion in corn production is expected to continue for the near future.

### Utilization and Trade

Coarse grain consumption in Canada during the late 1950's remained about constant with a declining trend on a per capita basis. In the mid-1960's, consumption increased; in per capita terms, the declining trend was halted and even moved upward slightly. Increased production of livestock and poultry accounted for the larger consumption. However, future increases in livestock and poultry production are expected to be smaller than in recent years.

Coarse grains have been increasing in relative importance to wheat for livestock feed. Barley and oats are the major coarse grains fed, but corn is increasing in importance. Canadian exports of barley and oats have generally trended downward, while corn imports have leveled off around 500,000 tons.

### Projections

Total Canadian coarse grain production is estimated to be about 16 million tons in 1970. Rates of feeding are expected to be maintained at high levels in response to rising consumer demand for meat. Exports of barley and oats will continue. Canada will need to import some corn despite its successful efforts to increase production of this crop.

### Australia

Australia is currently dependent on agricultural exports for about 70 percent of its foreign exchange earnings. Government policies are oriented toward expanding agricultural exports. Coarse grain production increased 48 percent between 1955-57 and 1965-67, compared with a 135-percent increase for wheat. Of particular interest in Australia is the development of new land areas with foreign capital. Production of sorghum for shipment to Japan is a major objective in this venture. Some newly developed areas in Australia are already being planted to sorghums, and small shipments have been made to Japan. The potential for development of sorghum crops in the southern part of Western Australia alone has been estimated at 810,000 hectares.

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### Past Trends in Production

Coarse grain production increased from 1.9 million tons in 1955-57 to 2.7 million tons in 1965-67--an increase of 40 percent. The comparable increase for wheat was 135 percent. As a consequence, the proportion of coarse grains to total grains dropped from one-third in 1955-57 to one-fourth in 1965-67.

Australia's coarse grain area increased by one-fourth between 1955-57 and 1965-67, while the wheat area more than doubled. Yields of most grains have increased substantially due to increased use of fertilizer and improved varieties.

### Factors Affecting Production

Australia is currently dependent on agricultural exports for about 70 percent of foreign exchange earnings (2). The Government has emphasized the expansion of agriculture to assure food and raw materials for export markets as well as for meeting domestic needs. No production controls currently are placed on wheat and coarse grains (rice acreage is controlled), so that growers have a free choice in deciding which grains to produce (4).

Most of the barley produced in Australia is sold through three grower-controlled marketing organizations. The barley is sold in the domestic and export markets at the best price, and total net proceeds are distributed to farmers in proportion to the quantities and in accordance with the varieties and grades of the barley they delivered (4).

Other policies are being pursued by the Federal Government which have a direct or indirect impact on grain production. Of particular interest is the development of new areas with the assistance of private capital from Japan and the United States. In Queensland, one scheme for land development is scheduled to add about 45 million hectares to pasture and crop production by 1977. Approximately 32,000 irrigated hectares of grain sorghum are planned for New South Wales and newly developed areas of the Ord River district in Western Australia. In the Tipperary section of Northern Australia, the area planted to sorghum in 1968/69 (9,700 hectares) was double that of the previous year; U.S. investors in the development expect to plant over 77,000 hectares in 1972. The potential for development of sorghum crops in the southern part of Western Australia has been estimated at 810,000 hectares. About 4,000 hectares are expected to be planted in sorghum in the Esperance area of Western Australia in 1968/69.

Gruen et al. have characterized Australian agriculture as "...a technically dynamic agriculture which is steadily using more capital, particularly in the form of farm machinery and equipment and an increasing volume of non-farm produced inputs such as fuel, fertilizer and other agricultural chemicals." (8, p. 159).

A subsidy of \$88 per long ton to manufacturers of nitrogen fertilizer went into effect in 1966. As a result, Australia's consumption of nitrogen fertilizer increased to an estimated 142,000 tons in 1967/68 or double the amount used in 1965/66. The subsidy has led to a sharp rise in the use of nitrogen in many wheat areas. Farmers using superphosphate have received a transport subsidy of \$6.61 per long ton since 1963 (3). This subsidy was increased to \$8.96 per long ton as of August 1968.

Agricultural research funding has increased in recent years and has resulted in improved varieties of barley. A U.S.-Australian enterprise in New South Wales is experimenting with high-yielding varieties of grain sorghum and other feed and forage crops (1, p. 22).

### Utilization

The use of grains for feed has shown a general increase. Wheat and oats are the two most important grains fed to livestock (or poultry), with each grain accounting for about one-third of total grains fed. The relative importance of corn and sorghum declined in the mid-1960's, but indications are that both of these grains will be emphasized in the early 1970's as export commodities to Japan. Barley accounts for one-eighth to one-fifth of the grains used as feed each year. Food use of coarse grains appears to have stabilized in excess of 180,000 tons annually, with per capita declines being offset by population increases. Other uses--seed and industrial--are continuing to grow due to the expansion of grain area and increased demand for barley for malting.

## Trade

Australia's exports of coarse grains show substantial year-to-year variations depending on the level of supplies (production plus beginning stocks) and on export markets. During 1959/60-1966/67, shipments ranged from a high of 1.1 million tons in 1960/61 to less than half that amount in 1965/66. Australia's most important and most stable export market during this period was Western Europe, which accounted for 50 to 88 percent of annual shipments. However, the importance of Japan as an export market for coarse grains is increasing, particularly for sorghum. Communist Asia, an important outlet during most of the early 1960's, is no longer a market for Australian coarse grain exports.

Australia's major coarse grain exports are barley and oats, but the level of export of barley has generally declined in recent years. Corn exports are minor. Sorghum exports show substantial year-to-year variation; in 1967/68, exports were at a record high.

During 1959/60-1966/67, exports of coarse grains averaged 30 percent of total domestic production. In the early part of this period, over two-fifths of the coarse grains were exported, compared with one-fifth in the latter years.

## Projections

Gruen et al. have developed "most likely" estimates for 1970 production, consumption, and exports of wheat, barley, and oats--the three major grains currently produced in Australia (8, p. 405).

These projections show output of wheat, barley, and oats increasing through 1970 (and even through 1975 and 1980). However, nearly all of the increased output occurring between the base period (average for the years 1958/59-1961/62) and 1970 (average of 1969/70 and 1970/71) will be in wheat. Both larger acreage and higher yields will contribute to expansion of grain output.

Use of wheat, barley, and oats for all categories of consumption--seed, food, and feed--is expected to increase from the base period to 1970 (although use of wheat for feed is expected to decline between 1965 and 1970). Increased domestic consumption of pork and poultry will expand feed grain use. Major exports of either pork or poultry in 1970 are considered unlikely.

Exports of barley and oats in 1970 are expected to be below those of the base period, since consumption of both grains is forecast to increase at a faster pace than production. Also, the base period used in the study coincided with peak exports of barley to Japan. These exports dropped sharply in later years as incomes and standards of living increased and Japanese food consumption patterns shifted from barley to rice and wheat. Exports of wheat will likely show a substantial rise above the base period level.

Projections by Gruen et al. do not provide an adequate assessment of near-term or future developments for sorghum. While sorghum exports will continue to expand through 1970, major production and export increases are likely to occur later.

## Thailand

Corn is the major coarse grain export of Thailand and Government policies are directed toward expanding production to further increase foreign exchange earnings. The Thai Government is encouraging increased grain fertilization, use of new grain varieties, and improved cultural practices. Coarse grain production in Thailand is expected to continue increasing to 1970/71. Although the National Plan calls for a strong commercial livestock industry, most of the corn and sorghum production will continue to be exported through 1970/71 or longer.

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### Trends in Production

Thai production of feed grains centers on corn, although some sorghum is produced and exported. Corn production rose from an annual average in 1953-55 of 60,000 tons to 1,200,000 tons in 1967. This increase is due to (1) expansion of planted area from 52,000 hectares in 1953-55 to 608,000 hectares in 1967, and (2) increase in yields from 1,154 kilograms per hectare in 1953-55 to 1,974 kilograms per hectare in 1967.

### Factors Affecting Production

The Thai Government's corn policy is aimed at further increases in production through encouraging fertilization, use of new grain varieties, and improved cultural practices. Agricultural extension services, credit, and corn price supports are provided. A further policy goal is diversification of export markets and increased domestic use of corn to stabilize the market.

American and Japanese export firms have been making heavy investments in Thai corn, ranging from drying and storage facilities in Bangkok to market information and even extension services in the upland areas.

### Trade

Government success at diversifying markets is mixed. The share of exports going to Japan has decreased from 80 percent in 1958 to 60 percent in 1967, with Hong Kong, Singapore, Taiwan, and Malaysia taking most of the rest. On the other hand, domestic demand has remained low and exports rose from 77 percent of production in 1953-55 to 98 percent of production in 1960.

### Projections

Thailand's Second National Economics and Development Plan (1967-1971) puts forward a production target of 1.5 million tons for corn and 300,000 tons for sorghum. The Plan also is committed to the promotion of a strong commercial

livestock industry. The latter will take some time to develop, and most of the corn and sorghum production will continue to be available for export during the next decade.

### Republic of South Africa

South Africa's major coarse grain export is corn, and Government policies are directed toward a further expansion of exports in 1970/71. The Government is extensively involved in marketing and distribution. Substantial increases in agricultural output in the Republic of South Africa during the postwar period can be partly attributed to the degree of price stability inaugurated by the marketing boards.

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### Past Trends in Production

Corn is the primary grain grown in the Republic of South Africa, accounting for over 90 percent of coarse grain output. Production of corn varies significantly from year to year, due to the extreme weather variability, but there is a substantial upward trend in both area and yield. The dramatic increase in corn production in 1966/67--with output in excess of 9 million tons--was due largely to extremely favorable weather. Production in both 1965/66 and in 1967/68 was around 5 million tons. Sorghum production had increased to over 800,000 tons in 1966/67, but also dropped abruptly in 1967/68 to only one-fourth this amount. As with corn, however, there is an uptrend in the area and yield of sorghum.

### Factors Affecting Production

The Government of South Africa is extensively involved in the marketing and distribution of agricultural products. The substantial increase in agricultural output achieved during the postwar period can be attributed, at least in part, to the degree of price stability inaugurated by the marketing boards. Exported corn is sometimes sold at a loss by the Government. This is motivated by (1) a desire to maintain a relatively high level of corn production to assure self-sufficiency, (2) the political influence of corn producers, and (3) a desire to use corn sales as a source of foreign earnings.

### Trade

Exports of feed grains include some sorghum and negligible amounts of oats. The main export, however, is corn. During 1951/52-1955/56, annual corn exports of the Republic of South Africa averaged 365,000 tons. Peak exports of 2.4 million tons occurred in 1963/64, followed by an annual average of only 390,000 tons in 1964/65-1966/67 (table 7).

## Projections

A study done under contract to the Economic Research Service, USDA, estimates that corn exports of the Republic of South Africa will approximate 3 million tons in 1970 and 3.5 million tons by 1975 (12). Production is projected at 7.8 million tons in 1970 and at 9.4 million in 1975. Domestic demand is put at 4.8 and 5.9 million tons in 1970 and 1975, respectively. The study assumes the continuation of existing Government policies and the expansion of the marketing and handling capacity for grains.

### Eastern Europe 9/

Coarse grain area for the whole of Eastern Europe has declined since 1950, but increased use of fertilizer and more mechanization has pushed output to higher levels in Poland, Bulgaria, Romania, and Yugoslavia. Increased production of meat and milk has sharply expanded feed grain requirements throughout Eastern Europe. However, net imports of coarse grains by Eastern Europe in 1970/71 are projected to be short of 1.5 million tons, about equal to net imports in 1961-65 (but substantially above the 0.2 million tons of net exports calculated for 1965/66-1967/68).

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### Past Trends in Production

Coarse grain production in Eastern Europe averaged 33.2 million tons during 1951-55, 39.1 million tons during 1956-60, and 40.6 million tons during 1961-65. 10/ Production peaked at 47.2 million tons in 1966, declining to 43.5 million tons in 1968. The decline in production was primarily a function of weather.

Total grain production (excluding rice) during the same periods averaged 47.4, 54.7, and 59 million tons, respectively, peaking at 74.8 million tons in 1967. The share of coarse grains in total production fell over the period from almost 70 percent to just above 63 percent.

### Factors Affecting Production

Major underlying factors affecting coarse grain production, as well as the output of other crops and livestock products in Eastern Europe since 1950, were collectivization and the various policies associated with the implementation of collectivization in the different countries of the region.

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9/ Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and Yugoslavia.

10/ All grains except wheat and rice.

The factors which can be directly related to coarse grain production are changes in area and other inputs. Between 1950 and 1968, the area sown to coarse grains in Eastern Europe declined from about 23 million hectares to slightly more than 20 million hectares. Area sown declined in the early 1950's, rose to 24 million hectares in 1957, and then declined after that. On the other hand, use of fertilizer in agriculture in Eastern Europe quintupled between 1950 and 1967--from 1.2 to 6 million tons of plant nutrients. In the period from 1959 to 1962, there was a slowdown in the rate of growth of fertilizer use, coinciding with the last major drive for collectivization. However, fertilizer use commenced to increase rapidly again in 1963. Between 1962 and 1965, application of plant nutrients per hectare of sown area more than doubled in Bulgaria, Czechoslovakia, Romania, and Yugoslavia. Increases in East Germany, Poland, and Hungary were less significant, ranging between 20 and 45 percent.

The increase in tractors and other machinery in agriculture in Eastern Europe has been relatively rapid since 1950. The rate of increase and the ratio of tractors to sown area differ considerably among the various countries. With the exception of Poland, the rate of increase in tractor deliveries to agriculture was greater during 1956-60 than during 1961-65. But in all countries except East Germany and Yugoslavia, the rate of increase in the latter period was still over 50 percent. Sizable increases also took place in 1966 and 1967.

#### Trends by Country

In East Germany, coarse grain production in 1961-65 was below the 1951-55 level. Yields, already high in the early fifties, changed little over the 15-year period, and did not offset the decline in area of roughly 400,000 hectares. In Czechoslovakia, yields were below those of East Germany in the early fifties, but well above those of other countries in the region. Coarse grain yields increased 3 quintals per hectare between 1951-55 and 1961-65, with two-thirds of the increase taking place in the decade of the fifties. Until 1962, the coarse grain area stayed relatively constant at around 18 million hectares, but dropped about 200,000 hectares thereafter. This decline in area accounts for the reduced output in Czechoslovakia since 1962 despite increased yields.

In Poland, yields of coarse grains--primarily rye, barley, and oats--rose steadily over the 1951-55 to 1961-65 period, about 2 quintals each 5-year period. The average yield during 1967 and 1968 was about 2 quintals per hectare above the 1961-65 average. The coarse grain area remained close to 8 million hectares until 1961, when it began to decline to the present 6.7-6.8 million hectares. Since 1965, output has stabilized at about 12.5 million tons, about 2.5 million tons above the level prevailing in 1951-55.

During the past decade, coarse grain production in Hungary has been fairly stable at around 5 million tons. This reflects a decline in area of about 400,000 hectares since 1957, with a compensating increase in yields.

The major increases in coarse grain output in Eastern Europe, except for Poland, have taken place in the three southern countries of Bulgaria, Romania, and Yugoslavia. In these countries, production exhibits wide annual fluctuations because of recurrent summer droughts which affect corn yields, the major feed



grain. Coarse grain production rose sharply in Bulgaria and Yugoslavia--from 14.1 and 12.2 quintals per hectare, respectively, in 1951-55 to 21.2 and 20.1 quintals in 1961-65. Yields were especially high in 1966, exceeding 30 quintals in Bulgaria and 27 quintals in Yugoslavia. Romania's yield increases were much less significant, going from 12 to over 17 quintals between 1951-55 and 1961-65. The peak yield in Romania was 23.3 quintals in 1966.

The coarse grain area in Yugoslavia rose from 3.2 to 3.7 million hectares between 1950 and 1957, before falling to the present 3.3 million hectares. Coarse grain area declined 300,000 hectares in Bulgaria and between 400,000 and 500,000 hectares in Romania during the same period. These area declines were more than offset by higher yields so that coarse grain production between 1951-55 and 1961-65 in these three countries increased by 500,000 tons in Bulgaria (29 percent), 1.5 million tons in Romania (28 percent), and 2.5 million tons in Yugoslavia (58 percent). The peak output level of 1966, however, was 5.8 million tons above the 1961-65 average.

### Utilization

Between 1954 and 1966, the total grain-consuming animal units in Eastern Europe increased about 11 percent. Coarse grain availabilities per animal unit--the supply of all grains except wheat after deducting other uses except feed--increased during the period, although significant annual fluctuations took place. Total grain availabilities (including wheat) per animal unit moved upward more consistently, indicating a greater use of wheat for feed in the northern countries of the region.

Cattle numbers decreased between 1950 and 1965 in Bulgaria and Hungary, remained unchanged in Czechoslovakia and Romania, and increased in East Germany, Poland, and Yugoslavia. Milk production increased 33 percent in the region and showed an especially pronounced upturn in Bulgaria and East Germany. Beef and veal output also rose sharply in all countries except Romania and Czechoslovakia where slower increases took place.

Between 1950 and 1965, hog numbers increased from 30 to 51 million, sheep numbers from 33 to 43 million, and poultry numbers from 66 to 273 million. During that period, egg output increased 100 percent, red meat production almost doubled, and poultry meat more than doubled.

There has probably been an improvement in feeding efficiency in Eastern Europe and much of the increased feed supply has gone into increased output rather than numbers, although the increases in hog and poultry numbers have been substantial. Both output and numbers have generally been determined by annual domestic feed availabilities.

### Trade

Total grain imports by Eastern Europe increased from 4.8 million tons in 1951-55 to 7.1 million tons in 1956-60 and to 8.5 million tons in 1961-65. Coarse grains accounted for 1.7, 2.1, and 2.9 million tons. Coarse grain imports

of around 2 million tons were characteristic of the years from 1953 through 1960. But from 1961 through 1964, coarse grain imports exceeded 3 million tons, peaking at 3.6 million tons in 1965. They dropped back sharply to the 2-to 2.5-million-ton range in 1965-67. Most grain imports, both food and feed grains, were taken by the northern countries.

Exports of 1 to 2 million tons of coarse grains, most of which came from the southern countries, reduced the level of net coarse grain imports substantially. Net coarse grain imports averaged 1 million tons during 1951-55, about 700,000 tons during 1956-60, and 1.3 million tons during 1961-65, peaking at 2.3 million tons in 1965. In 1966 and 1967, coarse grain exports exceeded imports; in 1968, net coarse grain imports were estimated at around 600,000 tons.

The peak level of total grain and coarse grain imports during 1961-65 appears to have been a function of declines in area, a slowdown in yield increases, and a reduction of wheat exports by the USSR to the region. The northern countries of Eastern Europe substitute coarse grains for wheat in their imports because both are used as feed. There was also a large decline in their potato production, a major feed crop, in the northern grain importing countries of the region during the early sixties. The improvement in grain production in Eastern Europe after 1964 and the return of the USSR as a supplier of wheat to the region brought about a return to the total grain and coarse grain import pattern of the 1956-60 period.

### Projections

Total production of coarse grains in Eastern Europe is projected at just over 47 million tons in 1970/71. This assumes a continuation of the present rate of decline in area and a yield slightly above that of 1966. This yield is projected under normal weather conditions because of an assumed continued upward movement in inputs and an improved economic situation.

Total coarse grain imports are projected at 2.5 million tons and exports at 1.1 to 1.2 million tons for 1970/71. Gross imports would be 500,000 tons lower than the 1961-65 average, but exports are projected to decline about 400,000 tons from the export level of that period. Thus, net imports are forecast for 1970/71 at 1.3 to 1.4 million tons, about as much as net imports during 1961-65. However, the net trade of Eastern Europe can change substantially from year to year depending on the influence of weather on corn production in the Danubian countries.

Yugoslavia is expected to return to the level of coarse grain exports during the last half of the fifties--about 300,000 to 400,000 tons; Romania is expected to continue large coarse grain exports, but to reduce these by roughly 200,000 tons; and Bulgaria is expected to have zero net coarse grain trade.

The major importers of coarse grains in 1970/71 are expected to be Poland, Czechoslovakia, and East Germany, in that order. The net imports of coarse grains by these three countries are expected to be slightly above the 1961-65 average, but about 500,000 tons less than the peak 1964/65 level. Hungary is expected to continue its relatively consistent level of coarse grain imports.

## USSR

Production of "usable" coarse grains in the USSR increased from 44 to 49 million tons between 1953-55 and 1961-65. Variation in agricultural policies, with regard to prices and capital investment in agriculture, alternatively encouraged and discouraged coarse grain production. Larger livestock numbers have expanded feed grain requirements. Consequently, despite increasing production of coarse grains, exports in 1970/71 are projected at 700,000 tons, about equal to the level of exports since 1966.

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### Past Trends in Production

Precision in the analysis of past trends in yields and production of coarse grains in the USSR is impaired by that country's practice of reporting such data in "bunker weight." To approximate "barn yield" and usable production, it is necessary to eliminate from the reported data excess moisture and foreign matter. Such adjustments affect both the level of production and the rate of change over time.

In terms of "bunker weight," total grain production (excluding rice) increased from 89.5 to 122.8 million tons between 1953-55 and 1961-65, and coarse grain production increased from 45.6 to 58.2 million tons. The increase in feed grains was from 26 to 39 million tons. During 1966-68, production of all grains and of coarse grains averaged well above these levels--about 155 million tons for all grains and about 63 million tons for coarse grains. Feed grains averaged 45 million tons.

USDA estimates of usable grain indicate an increase in total grain production of from 83 to about 100 million tons between 1953-55 and 1961-65, with coarse grains increasing from 44 to 49 million tons. Feed grains increased from 28 to 34 million tons. Using these estimates, averages for 1966-68 are about 131 million tons of total grain, including 54 million tons of coarse grain, and 38 million tons of feed grains.

### Factors Affecting Production

Two factors have been critical in determining the direction and level of coarse grain production in the USSR: (1) Major changes in sown area have altered greatly the composition of coarse grain production; and (2) agricultural policy--including changes in prices, farm incentives, capital investment, and the availabilities of machinery and fertilizer--has developed in a discontinuous pattern so that there are distinct periods in which agricultural policy has had a positive or negative impact upon the output of all crops and livestock products.

The rye area decreased steadily from 23.7 to 16 million hectares between 1950 and 1965, and then dropped sharply to the present level of about 12 mi-

lion hectares. The relative position of barley and oats area was reversed about 1960. Until then, barley had fluctuated between 8 and 12 million hectares, but shot up to 21.7 million hectares in 1964. It has subsequently declined to about 19 to 20 million hectares. Area in oats ranged between 13 and 16 million hectares until 1960, and then dropped to 5.7 million hectares in 1963. It has gradually increased to the present area of approximately 8 million hectares. The corn area was 4.8 million hectares in 1950, reached 6.6 million in 1956, fell to 3.3 in 1957, and then rose again to 7 million hectares in 1961. It has fallen again to its present level of about 3.2 million hectares.

Agricultural policies during 1953-57 greatly improved the level of farm prices and incentives, the availability of machinery and fertilizer, and the level of agricultural investment. During the period, yields of all coarse grains increased, with those of barley and corn exceeding those of rye and oats. Between 1958 and 1963, a change in agricultural policy produced little improvement in yields. Another change in agricultural policy in late 1964 stimulated an increase in yields which is continuing.

Between 1950 and 1965, corn was the only coarse grain to increase yields significantly, barley yields improved less rapidly, and only modest improvements occurred in the yields of rye and oats. These yields are reported in terms of "bunker weight" or estimates of "barn yield."

### Utilization

Between 1950 and 1965, cattle numbers in the USSR increased 50 percent, and cow numbers increased 58 percent. They increased another 11 and 7 percent, respectively, between 1965 and 1967, but both declined slightly in 1968. Hog numbers grew from 22.4 to 70 million between 1950 and 1963, but dropped sharply to 41 million during 1963. They recovered to almost 60 million by 1966, but declined in 1966, 1967, and 1968 to the present 49 million. Sheep numbers grew from 78 to 138 million between 1950 and the present, while goat and horse numbers declined. Both milk and meat production doubled between 1950 and 1965, egg output tripled, and wool production increased 123 percent. Between 1965 and 1968, output of each of these commodities increased another 15 percent.

These increases in numbers and output took place despite the relatively slow growth in feed grain production from 1950 to 1968. The only major non-grain feed source to increase significantly during the period was silage and other succulent feeds. Roughages and potatoes remained about the same, and major improvements in pastures do not appear to have taken place. There is evidence to indicate that wheat and rye became increasingly more important as livestock feeds after 1958, and that feeding of wheat increased further after the exceptionally large crop of 1966.

The absence of exact data on the "barn yield" of grain in the USSR does not permit a satisfactory analysis of grain utilization or the relationship of grains fed to livestock output. Soviet "bunker weight" grain figures indicate a larger absolute level of grain available for feed and a somewhat faster rate of increase in the grain supply than is the case with USDA estimates. Further research will be necessary before the problem can be resolved. However, using either "bunker weight" or estimated figures, even if large quantities of wheat

and rye are assigned to livestock feed, the share of grain in the feed supply is still low. This undoubtedly explains the continued Soviet emphasis upon increasing grain production despite sharp improvements since 1966.

### Trade

Coarse grain exports by the USSR averaged 1.8 million tons during 1951-55, dropped about 200,000 tons below that level during 1956-60, and rose about 200,000 tons above it in 1961-65. Coarse grain exports dropped to less than 1 million tons after the 1966 wheat crop made possible the resumption of larger wheat exports. 11/ The USSR has never been a significant importer of feed or coarse grains.

### Projections

Soviet output of coarse grains in 1970 is projected at more than 57 million tons of usable grain, including more than 42 million tons of feed grains. Barley will remain the major feed grain. The estimated level of feed grain production represents an increase of 10 million tons over the 1961-65 average, but only 4 million tons above the 1966-68 level. Total coarse grain production, however, would be up only 8 million tons over the 1961-65 average, and 3 million tons above the 1966-68 average because of the declining trend in rye production.

Despite a projected decline in total coarse grain area, feed grain production should remain relatively stable. The production increase will be due essentially to yield increases. Greater fertilizer inputs probably will be allocated to feed grains. Total fertilizer use per hectare of arable land amounted to about 35 kilograms of nutrients in 1967, compared with 12.2 kilograms in 1960. Other aspects of improved management also should help boost feed grain yields.

Net exports by the USSR of more than 700,000 tons of coarse grains are projected for 1970/71. About one-half of this amount is expected to be feed grains and the remainder will be rye and miscellaneous grains. The projected exports represent a considerable reduction from typical Soviet coarse grain exports through 1965, but a continuation of the pattern since 1966.

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11/ The USSR supplies East Germany, Czechoslovakia, and, to a certain extent, Poland with a given annual supply of grain. When wheat is in short supply, feed grains and rye are shipped or vice versa, because these countries need large quantities of wheat and also produce wheat. If the USSR ships feed grains, these countries consume more of their own wheat as food. If the USSR ships wheat, they use more wheat as feed. Since 1966, the USSR has had large wheat availabilities, but less feed grains.

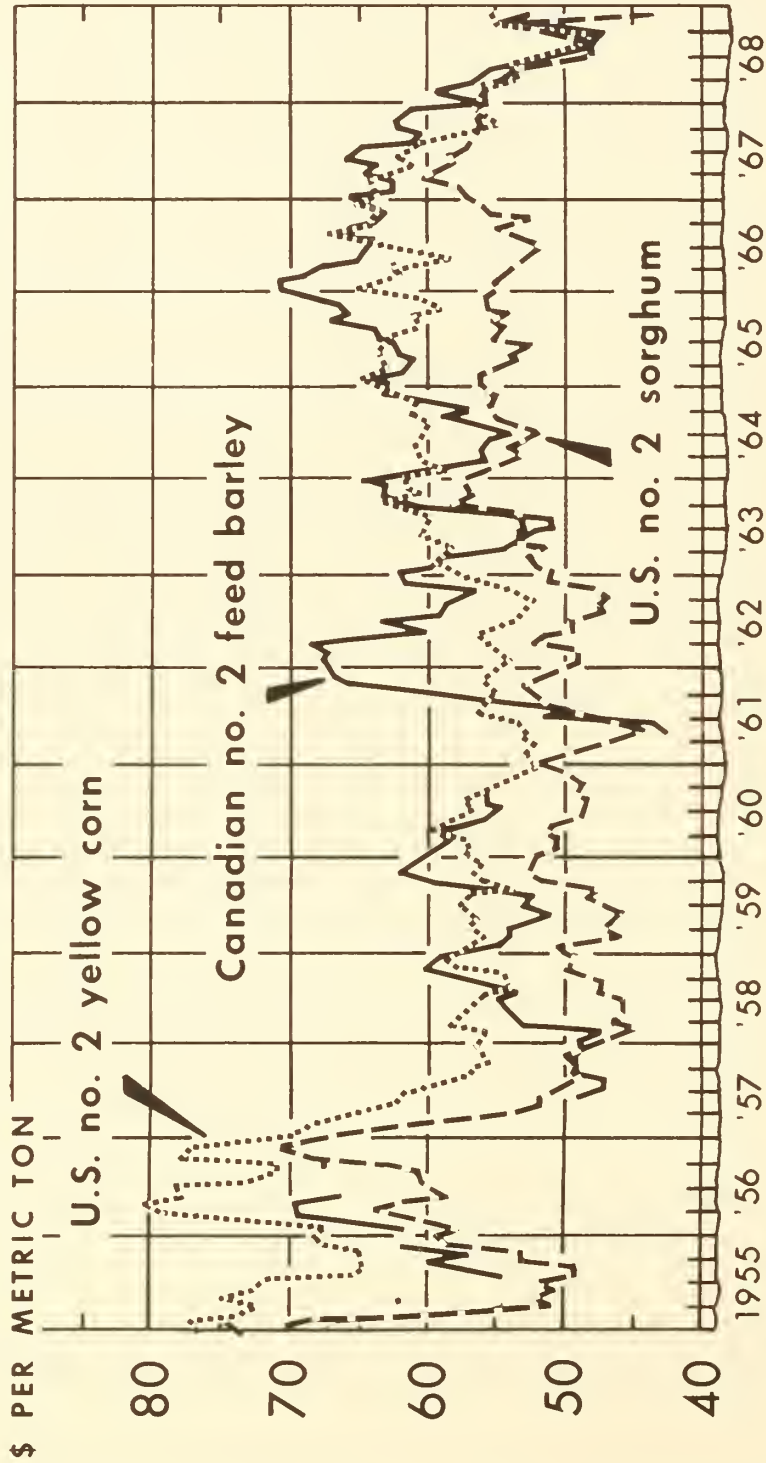
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# MONTHLY IMPORT PRICES OF SELECTED GRAINS

(Nearest forward shipment, c.i.f. European ports)



SOURCE: 1955-64, FAO GROUP ON GRAINS, ROME, 1965. 1965-68 FROM VARIOUS ISSUES OF STATISTISCHER MONATSBERICHT, DES BUNDESMINISTERIUMS FÜR ERNÄHRUNG, LANDWIRTSCHAFT UND FORSTEN, BONN, WEST GERMANY AND EEC MARCHES AGRICOLES, PRIX, PRODUITS VEGETAUX.

U. S. DEPARTMENT OF AGRICULTURE

NEG. ERS 6938 - 69 (5)

ECONOMIC RESEARCH SERVICE

Figure 1



Table 1.--Beginning stocks of coarse grains in major exporting countries, 1954/55-1968/69 1/

Year	Total	Corn	Barley	Million tons			Rye	Stocks held by the United States	
				Oats	Sorghum	Million tons		Percent	
1954/55.....	35.8	24.2	4.8	5.2	0.6	1.0	29.2	82	
1955/56.....	41.5	27.6	5.3	5.8	1.9	.9	35.8	86	
1956/57.....	46.0	31.0	5.2	6.9	2.1	.8	39.6	86	
1957/58.....	53.8	37.4	6.8	7.0	2.0	.6	44.5	83	
1958/59.....	61.0	38.7	6.7	7.1	7.9	.6	53.9	88	
1959/60.....	68.2	39.7	7.8	7.3	12.9	.5	61.5	90	
1960/61.....	74.5	46.2	7.3	5.7	14.8	.5	68.0	91	
1961/62.....	84.3	51.9	7.2	6.8	17.8	.6	77.2	92	
1962/63.....	70.1	43.3	4.5	5.2	16.8	.3	65.3	93	
1963/64.....	64.7	35.6	5.9	6.3	16.6	.3	58.2	90	
1964/65.....	70.8	40.0	6.7	7.5	16.3	.3	62.9	89	
1965/66.....	56.9	30.8	5.1	6.1	14.4	.5	50.7	89	
1966/67.....	44.6	<u>2/21.8</u>	5.5	6.6	9.9	.8	38.6	88	
1967/68.....	41.8	<u>2/22.3</u>	6.9	5.6	6.2	.8	34.2	83	
1968/69 <u>3/</u> .....	54.3	<u>2/34.9</u>	<u>2/7.2</u>	4.3	7.2	.7	45.1	83	

1/ Stock figures are for the beginning of the country's crop year. The countries included for the various grains are: Corn--United States, Canada, Argentina, and Republic of South Africa; Parley--United States, Canada, Argentina, Australia, and France; Oats--United States, Canada, and Argentina; Sorghum--United States; Rye--United States and Canada.

2/ Corn stocks exclude Canada and barley stocks exclude France.

3/ Preliminary.

Sources: (2) and (10).

Table 2.--World grain production, by type of grain, 1955-68

Year	Total grains <u>1/</u>	Coarse grains							Millet and sorghum	Other <u>2/</u>
		Wheat	Rice (paddy)	Total	Rye	Barley	Oats	Corn		
		1,000 tons								
1955.....	812,296	200,376	209,352	402,054	36,838	61,136	62,373	142,683	33,658	65,366
1956.....	841,737	211,596	219,657	408,909	34,058	68,094	61,237	146,844	33,102	65,574
1957.....	835,246	210,411	215,363	407,992	35,368	63,438	56,194	147,380	44,394	61,218
Average:										
1955-57....	830,093	207,461	214,791	406,318	35,421	64,223	59,935	145,636	37,051	64,053
1958.....	896,912	236,220	232,536	426,669	36,647	65,395	60,259	158,183	46,376	59,809
1959.....	876,125	223,216	228,622	422,615	36,887	65,464	51,961	173,830	45,449	49,024
1960.....	896,340	222,016	234,209	438,505	34,057	71,469	55,858	181,017	47,835	48,269
1961.....	881,735	211,519	238,747	429,676	33,990	69,368	48,722	177,915	44,577	55,104
1962.....	928,396	237,814	237,734	451,024	31,691	78,743	48,301	179,793	47,659	64,837
1963.....	939,346	226,211	247,739	463,537	30,150	81,965	45,254	193,314	49,382	63,472
1964.....	972,974	257,303	258,809	454,947	31,827	87,627	40,604	183,154	49,158	62,577
1965.....	968,395	247,120	248,868	470,507	33,753	86,811	42,885	195,545	48,325	63,188
1966.....	1,025,514	284,880	243,570	495,264	29,714	94,291	44,771	207,012	54,494	64,982
1967.....	1,080,321	276,606	269,075	532,560	30,429	96,265	46,360	233,196	59,296	67,014
1968.....	1,098,927	305,292	269,285	522,250	30,465	101,281	49,412	218,042	56,583	66,467
Average:										
1965-67....	1,024,744	269,535	253,838	499,444	31,299	92,456	44,672	211,918	54,038	65,061

1/ Includes wheat, rice, coarse grains, and teff, a food grain grown in Ethiopia, and pulses for Mainland China.

2/ Includes mixed grains, meslin, spelt, buckwheat, canary seed, and small amounts of millet and sorghum. Also includes all coarse grains, including pulses, for Mainland China.

Source: Compiled by ERS from publications of the U.S. Government and international or regional organizations; reports of U.S. Agricultural Attachés and the Foreign Agricultural Service.

Table 3.--World production of rye, barley, oats, corn, and millet and sorghum, by major countries or areas, 1955-57 and 1965-67 <sup>1/</sup>

Crop and area	Production		Percentage of production		Annual rate of change between 1955-57 and 1965-67
	1955-57	1965-67	1955-57	1965-67	
	1,000 tons	tons	Percent	Percent	Percent
<b>Rye:</b>					
Soviet Union.....	15,013	12,833	42.4	41.0	-1.6
Eastern Europe.....	11,362	11,129	32.1	35.6	-.2
EEC.....	4,937	3,662	13.9	11.7	-2.9
Other Western Europe <sup>2/</sup> .....	1,751	1,430	5.0	4.6	-2.0
West Asia.....	639	768	1.8	2.4	1.9
United States.....	668	721	1.9	2.3	.8
Canada.....	260	398	.7	1.3	4.3
Argentina.....	721	289	2.0	.9	-8.8
Other.....	70	69	.2	.2	-.1
World total.....	35,421	31,299	100.0	100.0	-1.2
<b>Barley:</b>					
Soviet Union.....	9,973	21,233	15.5	23.0	7.8
EEC.....	7,403	13,430	11.5	14.5	6.2
Other Western Europe <sup>3/</sup> .....	3,878	10,997	6.1	11.9	11.0
United Kingdom.....	2,944	8,710	4.6	9.4	11.5
United States.....	8,873	8,407	13.8	9.1	-.5
Eastern Europe.....	5,510	7,881	8.6	8.5	3.7
West Asia.....	5,724	5,813	8.9	6.3	.2
Canada.....	5,009	5,226	7.8	5.7	.4
Denmark.....	2,387	4,222	3.7	4.6	5.0
South Asia.....	3,329	2,903	5.2	3.1	-1.1
Other.....	9,193	3,634	14.3	3.9	-8.9
World total.....	64,223	92,456	100.0	100.0	3.7

Table 3.--World production of rye, barley, oats, corn, and millet and sorghum, by major countries or areas, 1955-57 and 1965-67--Continued

Crop and area	Production		Percentage of production		Annual rate of change between 1955-57 and 1965-67
	1955-57	1965-67	1955-57	1965-67	
	- - - 1,000 tons	- - -	Percent	Percent	Percent
<b>Oats:</b>					
United States.....	19,050	12,180	31.8	27.3	-4.4
Soviet Union.....	12,042	7,233	20.1	16.2	-5.0
EEC.....	7,565	6,231	12.6	14.0	-1.9
Canada.....	6,379	5,546	10.6	12.4	-1.4
Eastern Europe.....	5,600	4,972	9.3	11.1	-1.2
Other Western Europe 2/.....	4,195	4,527	7.0	10.1	+ .6
Oceania.....	784	1,298	1.3	2.9	+5.1
United Kingdom.....	2,486	1,246	4.2	2.8	-6.6
Argentina.....	953	537	1.6	1.2	-5.6
Other.....	880	902	1.5	2.0	.2
World total.....	59,935	44,672	100.0	100.0	-2.9
<b>Corn:</b>					
United States.....	76,149	109,747	52.3	51.8	3.8
Eastern Europe.....	14,444	20,065	9.9	9.5	+3.3
Brazil.....	7,151	11,532	4.9	5.4	4.9
Mexico.....	4,457	8,233	3.1	3.9	6.4
EEC.....	4,808	7,649	3.3	3.6	4.7
Argentina.....	3,038	6,727	2.1	3.2	8.3
Republic of South Africa.....	3,944	6,393	2.7	3.0	4.9
South Asia.....	4,632	6,686	3.2	3.2	3.7
Soviet Union.....	8,327	7,067	5.7	3.3	-1.7
East Africa.....	3,618	5,900	2.5	2.8	5.0
East Asia and Pacific Islands.....	2,839	4,290	1.9	2.0	4.2
Canada.....	752	1,693	.5	.8	8.4
Other.....	11,477	15,936	7.9	7.5	3.3
World total.....	145,636	211,918	100.0	100.0	3.8

Table 3.--World production of rye, barley, oats, corn, and millet and sorghum, by major countries or areas, 1955-57 and 1965-67--Continued

Crop and area	Production		Percentage of production		Annual rate of change between 1955-57 and 1965-67
	1955-57	1965-67	1955-57	1965-67	
	1,000 tons		Percent		Percent
Millet and sorghum:					
United States.....	8,594	18,150	23.2	33.6	7.7
South Asia.....	15,157	17,354	40.9	32.1	1.4
West Africa.....	6,693	7,940	18.0	14.7	1.7
East Africa.....	3,424	3,930	9.2	7.3	1.4
North Africa.....	1,893	2,558	5.1	4.7	3.1
Argentina.....	256	1,607	.7	3.0	19.6
Mexico.....	4/96	1,082	.2	2.0	40.0
Republic of South Africa.....	180	539	.5	1.0	11.6
Oceania.....	135	236	.4	.4	5.8
Other.....	624	643	1.7	1.2	.3
World total.....	37,051	54,038	100.0	100.0	3.9

1/ Data in this table may be somewhat different from data reported in individual country or area statements due to difference in source of information.

2/ Excludes the United Kingdom.

3/ Excludes the United Kingdom and Denmark.

4/ 1957 only. No production reported prior to 1957.

Table 4.--World utilization of coarse grains, 1955/56-1957/58 and 1961/62-1963/64

Type of grain and use	Developed countries 1/		Developing countries 1/		Total
	1955/56- 1957/58	1961/62- 1963/64	1955/56- 1957/58	1961/62- 1963/64	
	Million tons				
All grains.....	259.0	302.2	125.9	157.3	384.9
Wheat.....	75.4	78.9	47.5	59.3	122.9
Coarse grains.....	183.6	223.6	78.4	98.0	262.0
Use:					
Food.....	16.0	13.6	51.8	63.5	67.8
Feed.....	149.1	187.9	17.6	22.1	166.7
Beverage and indus- trial.....	9.7	13.6	2.4	4.4	12.1
Seed and waste.....	8.8	8.3	6.7	8.0	15.5
Type:					
Rye.....	8.2	7.4	1.2	1.1	9.4
Barley.....	34.9	40.8	13.3	13.6	48.3
Oats.....	42.3	36.3	1.4	1.4	43.7
Corn.....	87.7	121.3	32.3	43.3	120.0
Millet and sorghum....	10.5	17.6	30.1	38.6	40.7

1/ Developed countries include North America, Western Europe, Oceania, Republic of South Africa, Japan, and Israel. Developing regions include Central and South America, Africa (excluding Republic of South Africa), and Asia (excluding Mainland China, North Korea, Vietnam, Japan, and Israel).

Source: (6, p. 11).

Table 5.--Trade in grains related to world production, averages 1956/57-1957/58 and 1964/65-1965/66

Grain	Average 1956/57-1957/58		Average 1964/65-1965/66	
	Production : Exports : production :	Exports as : percentage of : production :	Production : Exports : production :	Exports as : percentage of : production :
	--- 1,000 tons ---	Percent	--- 1,000 tons ---	Percent
Wheat.....	219,409	14.1	263,101	20.9
Coarse grains.....	352,323	5.2	409,990	9.4
Rye.....	35,358	2.6	31,765	1.6
Barley.....	65,642	10.7	89,576	7.3
Oats.....	59,230	2.7	42,753	3.6
Corn.....	150,802	4.9	195,237	12.4
Millet and sorghum.....	41,291	3.3	50,659	11.3

Source: Computed from tables 2 and 7. Production and export data not completely comparable in that trade among the Centrally Planned Countries is excluded from exports.

Table 6.--Gross imports of coarse grains by principal importing countries, average 1951/52-1955/56 and annual, 1956/57-1966/67 1/

Country or area	Average	1951-52-	1956/57-	1957/58-	1958/59-	1959/60-	1960/61-	1961/62-	1962/63-	1963/64-	1964/65-	1965/66-	1966/67
		1955/56											
								1,000 tons					
Belgium-Luxembourg..	1,172	1,547	1,515	1,484	1,597	1,439	1,566	1,576	1,477	1,640	2,145	2,539	
France.....	623	409	353	528	219	228	500	666	487	741	672	542	
West Germany.....	2,096	2,965	2,418	2,766	3,068	1,939	4,628	3,066	3,144	4,098	5,196	4,542	
Italy.....	330	733	955	1,088	2,094	2,441	2,674	3,888	5,208	4,645	6,711	6,254	
Netherlands.....	1,360	2,374	2,013	2,328	2,909	2,834	2,920	3,129	3,164	2,840	3,194	2,986	
Total EEC.....	5,581	8,028	7,254	8,194	9,887	8,881	12,288	12,325	13,480	13,964	17,918	16,863	
Austria.....	482	547	535	485	649	513	421	606	539	654	1,065	510	
Denmark.....	404	458	530	1,002	1,410	846	868	840	777	752	728	701	
Spain.....	57	92	87	129	173	683	504	831	2,019	1,553	3,146	3,094	
Switzerland.....	365	487	415	376	490	496	384	608	562	596	652	847	
United Kingdom.....	2,700	2,854	3,614	4,002	4,576	4,501	5,167	4,675	4,224	3,920	4,316	4,125	
Eastern Europe 2/3/:	238	293	350	460	615	490	185	615	1,185	1,180	1,780	1,195	
Canada.....	138	304	215	333	313	517	786	778	578	434	551	531	
Israel.....	95	128	234	336	343	412	394	411	459	380	485	601	
India.....	353	---	13	122	69	190	76	---	70	121	1,100	2,295	
Japan.....	974	1,403	1,323	1,561	1,323	1,878	2,407	2,948	4,568	5,108	5,202	7,771	

1/ Includes rye, barley, oats, corn, millet and sorghum.

2/ Excludes Yugoslavia.

3/ Excludes trade among the Centrally Planned Countries.



Table 7.--Gross exports of rye, barley, oats, corn, and millet and sorghum by principal exporting countries, average 1951/52-1955/56 and annual, 1956/57-1966/67

Grain and major exporter	Average												
	1951/52- 1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	
	1,000 tons												
Rye:													
United States.....	76	272	90	215	134	196	190	525	225	54	96	104	
Argentina.....	345	251	282	110	80	114	25	---	69	96	51	---	
Canada.....	265	265	133	115	122	96	109	194	140	125	202	239	
Fed. Rep. of Germany.....	91	35	47	145	62	325	45	6	6	2	7	23	
Sweden.....	29	51	14	2	2	1	115	36	1	1	24	7	
USSR.....	164	170	80	100	300	150	240	155	30	30	---	117	
Total exports 2/	1,110	1,090	720	780	840	1,020	930	1,040	580	500	525	580	
	Percent												
Major suppliers as percentage of total.....	87	96	90	88	83	86	76	88	81	62	72	84	
	1,000 tons												
Barley:													
United States.....	915	1,249	1,893	2,447	2,488	1,809	1,787	1,404	1,466	1,268	1,618	936	
Argentina.....	461	581	504	259	323	153	213	50	302	446	145	52	
Australia.....	446	601	432	679	567	769	713	234	429	369	227	428	
Canada.....	1,806	1,771	1,536	1,463	1,275	838	898	228	887	723	706	992	
France.....	24	1,544	624	35	408	1,080	1,661	977	2,254	2,241	1,839	1,837	
United Kingdom....	88	12	44	137	361	124	341	185	76	111	678	1,108	
Total exports 2/	5,550	7,380	6,680	6,400	6,090	5,820	7,150	4,600	6,850	6,470	6,670	6,250	
	Percent												
Major suppliers as percentage of total.....	67	78	75	78	89	82	79	67	82	80	78	86	

Continued--

Table 7.--Gross exports of rye, barley, oats, corn, and millet and sorghum by principal exporting countries, average 1951/52-1955/56 and annual, 1956/57-1966/67--Continued

Grain and major exporter	Average												
	1951/52- 1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	
						<u>1,000 tons</u>							
Oats:													
United States.....	121	361	371	433	630	389	270	331	71	60	524	246	
Canada.....	792	284	478	123	119	35	47	318	283	190	276	79	
Argentina.....	259	299	603	190	255	247	374	115	287	491	167	158	
Australia.....	146	148	42	319	217	345	346	322	303	367	251	402	
Total exports 2/:	1,560	1,400	1,740	1,300	1,510	1,200	1,410	1,310	1,190	1,480	1,580	1,270	
Major suppliers as percentage of total.....	84	78	86	82	81	85	74	83	79	75	77	70	
						<u>1,000 tons</u>							
Corn:													
United States.....	2,580	3,559	4,608	5,115	5,431	6,608	9,933	10,069	11,512	13,228	17,121	12,856	
Argentina.....	957	1,097	1,061	2,111	3,187	1,864	2,226	2,723	2,459	3,442	2,923	5,088	
Mexico.....	12	7	---	---	---	53	2	1	---	945	1,327	1,044	
Brazil.....	51	---	---	---	4	6	---	48	714	27	632	540	
Republic of South Africa.....	365	859	1,233	752	351	786	1,573	2,290	2,351	588	140	439	
Yugoslavia.....	166	13	406	393	508	385	145	86	51	21	117	797	
Thailand.....	16	85	83	150	280	519	589	722	923	896	1,132	1,188	
France.....	---	1	7	42	95	670	343	111	848	551	879	1,834	
Total exports 2/:	5,060	6,550	8,290	9,350	10,790	12,130	16,660	18,220	21,040	22,110	26,110	25,190	
Major suppliers as percentage of total.....	82	86	89	92	91	90	89	88	90	89	93	94	

Continued--

Table 7.--Gross exports of rye, barley, oats, corn, and millet and sorghum by principal exporting countries, average 1951/52-1955/56 and annual, 1956/57-1966/67--Continued

Grain and major exporter	1,000 tons												Percent
	Average 1951/52- 1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	
Millet and sorghum:													
United States.....	1,199	742	1,075	2,402	2,484	2,195	2,179	3,018	2,521	3,018	6,177	7,100	
Argentina.....	62	3/169	155	333	229	244	689	392	678	707	513	1,245	
Australia.....	55	35	13	81	73	6	39	55	8	14	7	64	
Republic of South Africa.....	31	11	66	39	54	53	152	17	60	108	172	200	
Sudan.....	23	58	31	67	116	136	88	74	88	68	117	120	
Morocco.....	33	29	15	10	---	55	25	9	55	33	34	17	
Total exports 2/	1,660	1,160	1,540	3,010	3,150	2,830	3,300	3,770	3,570	4,170	7,320	9,400	
Major suppliers as percentage of total.....	85	90	88	97	94	95	96	95	96	94	96	93	

1/ Preliminary.

2/ Excludes trade among the Centrally Planned Countries.

3/ 1956 calendar year.

Source: (7).

Table 8.--Coarse grain production, consumption, and trade for selected base periods, and projections for 1970/71, selected countries

Area or country	Source of estimate	Base period	Production		Consumption		Net imports <u>1/</u>
			1970/71	1970/71	1970/71	1970/71	
----- Million tons -----							
European Economic Community.....	ERS	1965/66-1966/67	30.8	36-38.	43.0	48.	12.2
United Kingdom.....	do.	do.	9.7		13.0		3.3
	( <u>11</u> )	1959-63	<u>2/6.6</u>	<u>3/9.2</u>	<u>4/10.9</u>	<u>3/14.2</u>	<u>5/3.5</u>
Spain.....	ERS	<u>6/1967/68-1968/69</u>	5.0	7.0	7.4	9.0	2.4
Denmark.....	do.	1965/66-1966/67	<u>7/5.4</u>	Increase	<u>7/5.8</u>	Increase	<u>7/4</u>
Japan.....	do.	do.	1.4	1.	7.4	12.	6.5
Argentina.....	do.	do.	8.8	12-12.5	4.6	Increase	-4.2
Brazil.....	do.	1965-67	11.4	13.	10.8	12.	-0.6
Mexico.....	do.	1965/66	9.0	11-12.	7.8	Increase	-1.2
Canada.....	do.	do.	13.	16.	11.2	Increase	-1.8
Australia.....	do.	1965/66-1966/67	3.0	---	2.2	---	-0.8
	<u>2/(8)</u>	1958/59-1961/62	1.2	<u>8/1.3</u>	.7	<u>8/0.9</u>	-0.5
Thailand.....	( <u>14</u> )	1967	<u>9/1.2</u>	<u>10/1.8</u>	---	Increase	<u>9/-1.2</u>
							Increase ex-ports

Table 8.--Coarse grain production, consumption, and trade for selected base periods, and projections for 1970/71, selected countries--Continued

Area or country	Source of estimate	Base period	Production		Consumption		Net imports <sup>1/</sup>
			Base period: 1970/71	Base period: 1970/71	Base period: 1970/71	Base period: 1970/71	
Republic of South Africa.....	2/(12)	1963/64-1965/66	4.4	7.8	3.9	4.8	-0.5
Eastern Europe.....	ERS	11/1965/66-1967/68	44.6	47.	44.4	48.5	-0.2
USSR.....	do.	11/do.	51.8	57.	51.2	56.	-1.

1/ Includes changes in stocks.

2/ Barley and oats only.

3/ 1970 with net imports excluding grain products.

4/ Grain for livestock only.

5/ Excludes grain products.

6/ Preliminary.

7/ Excludes rye.

8/ 1969/70-1970/71.

9/ Corn only.

10/ Corn and sorghum.

11/ Production occurs in the first year and trade is calendar year data for the second year, or the year following production.

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